PM_{10} SIP

~~BASE YEAR~~

POINT AND AREA

INVENTORY PROTOCOL

DRAFT

PM_{10} ~~BASE YEAR~~ SIP POINT AND AREA INVENTORY PROTOCOL

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PM_{10} ~~BASE YEAR~~ SIP POINT AND AREA INVENTORY PROTOCOL

1. INTRODUCTION

The State of Utah developed a SIP for PM_{10} encompassing Salt Lake and Utah Counties in the early 1990's which was approved by the EPA in 1994. This SIP targeted ~~the~~ Utah's historical problem with secondary particulate formation during wintertime inversions along the Wasatch Front-, ~~A~~although the tools used at that time were inadequate for secondary particulate. During the time since the SIP was approved, ambient air monitoring data from a number of locations along the Wasatch Front have continued to be at or ~~very~~ near the National Ambient Air Quality Standards (NAAQS).

Although there have been no violations of the NAAQS in the nonattainment areas since the current SIP was implemented, UDOT expects that the next round of long-range transportation plans and transportation improvement plans, due in 2000 for Utah County and 2001 for Salt Lake County, will not be able to show conformity to the PM_{10} SIP. Much of this nonconformity is the result of EPA changes to mobile emissions models that were used to establish emission budgets in the current SIP and mobile growth far greater than predicted at the time the SIP was developed. For these reasons the Utah Division of Air Quality (UDAQ) has decided to create an entirely new PM_{10} SIP. It is possible that the work product could turn out to be a Maintenance Plan, in which case the nonattainment areas could be redesignated to attainment.

An additional incentive for redoing the PM_{10} SIP is to fix elements of the current SIP which have created ongoing difficulties in implementation. When the existing SIP was developed, significant control strategies were implemented at most major point sources throughout the two nonattainment areas. This was done with point-specific emission limits, itemized in appendices to the SIP, and adopted into federal law. This creates an awkward situation when a source requests a revision to an approval order (Utah NSR permit) because until the change is approved by the EPA as a SIP revision, the source is subject to different State and Federal requirements.

A major consideration in redoing the PM_{10} SIP is that modeling tools have advanced in the years between the development of the current SIP in the late 1980's and today. The current SIP is based on dated receptor modeling and county-wide roll-back of PM_{10} , SO_2, and NO_x. For this new SIP/Maintenance Plan, UDAQ in consultation with the EPA Region VIII, has decided to take a two pronged approach to the attainment demonstration. This approach will consist of a grid-based aerosol modeling analysis using UAM-AERO and speciated linear rollback. The attainment/maintenance demonstration would be based on the results of one or both of these models.

The basis for the modeling process is the emissions inventory. This document explains the procedures the UDAQ will use to calculate 1996 base year emission estimates for area and point sources within the PM_{10} domain and the procedures for projecting future air pollution emissions.

This document ~~was~~ is organized to be consistent with SIP Technical Support Documentation.

2. EMISSIONS DATA PREPARATION

The UDAQ has developed a 1996 annual inventory for the state. The annual point source inventory for Salt Lake and Davis Counties consists of data on sources that have 10 tons/year of VOC or 25 tons/year of NO_x. UDAQ has data on sources in Utah and Salt Lake Counties with 25 tons/year of PM_{10} and SO_x. Inventory data has been gathered for Title V sources, major criteria and major HAP sources, New Source Performance Standard (NSPS), National Emissions Standards for Hazardous Air Pollutants (NESHAP), and Maximum Achievable Control Technology (MACT) sources in other areas of the domain. This data will be used to develop winter day inputs for PM_{10} emissions from the episode period spanning February ~~10 - 16~~6 - 9 and 11-15, 1996.

PM_{10} area and point source domain ~~area~~ emissions will be calculated using methods outlined in EPA's current inventory development guidance, the "Emission Inventory Improvement Program (EIIP)", EPA-454/R-97-004a, July 1997, document unless otherwise indicated. The various methods for individual area source categories are outlined in Section 5, *Area Source Emissions Data* of this document.

References are made in this document to a software model called SMOKE[1], Sparse Matrix Operator Kernal Emission modeling system. This software will be used to apportion annual emissions to episode day in area categories. The exceptions to using SMOKE defaults occur when the situation in Utah varies from the assumptions used in the software.

An ammonia inventory was not developed in 1996. However, ammonia data was requested from point sources in 1997 and 1998. This data will be used to complete an ammonia inventory of point sources. In addition, the 1996 Toxics Release Inventory (TRI) includes ammonia emissions for some processes at some sources. Where there are discrepancies between the TRI and the 1997/1998 inventories, sources will be contacted to resolve the conflicts. This data will be included in the ammonia inventory. The 1996 throughput and emission factors from the "EPA Compilation of Air Pollutant Emission Factors", (AP-42) and "Development and Selection of Ammonia Emission Factors", EPA/600/R-94/190, August 1994, will be used to calculate the ammonia emissions. The area ammonia data will be calculated using the methods outlined in the Section 10, *Ammonia Sources*.

Projections of ammonia emissions shall be based on the surrogate growth rates, such as the projected increase in the number of livestock in the domain.

3. PM_{10} MODELING DOMAIN

[1]More information about SMOKE can be found on the website http://www.envpro.ncsc.org/products/smoke.

The proposed emissions modeling domain consists of all or portions of Box Elder, Cache, Davis, Juab, Morgan, Rich, Salt Lake, Sanpete, Summit, Tooele, Utah, Wasatch, and Weber and counties. A map of the area is shown on page 7 ~~follows~~. All but Salt Lake and Utah Counties and Ogden City are currently designated as attainment of the federal PM_{10} standard.

4. DATA BASES

Base year 1996 emissions inventories for the study region will be developed from the basic annual 1996 emissions data set compiled by the UDAQ. The data will be analyzed for any data holes or inaccurate assumptions. Needed actions will be prioritized and modifications will be made to improve the accuracy of the current data. The scope of this work will depend on available resources. Potential actions are outlined in Section 12, *Future Actions*. Any modifications will be documented. The periodic inventories for CO and ozone will be reviewed to see if any changes have an impact on these submittals. Actions that are needed due to any impacts will be negotiated with EPA.

5. AREA SOURCE EMISSIONS DATA

This section explains the area categories that will be included in the PM_{10} area source inventory. Many of these categories were included in the UDAQ 1996 Statewide Annual Area Emissions Inventory during its development. Many of the methods used to calculate the annual area inventory categories are contained in EIIP. UDAQ will continue to use these methods. However, some of the methods have been updated. In order to comply with the EPA guidance, UDAQ will use methods outlined in EIIP for the area emission calculations unless otherwise specified in the following sections. The use of any method which deviates from EIIP will be explained and submitted for EPA approval.

Some categories have been included in the EIIP that UDAQ has not previously incorporated into the area inventory. These will be added to the PM_{10} emission inventory. In addition, there are categories which UDAQ believes to be significant emitters of PM_{10} and PM_{10} precursors that are not included in EIIP. These categories are being added to this inventory.

Since the PM_{10} modeling domain includes portions of some counties while excluding other portions of the same counties, a method was devised to rationally divide countywide totals for each polluting category. The emissions from each category ~~were~~ are indexed to one of three distribution methods. Those methods are:

(1) Distribution by facility location (IN-OUT),
(2) Distribution by county land acreage (LAND), and
(3) Distribution by county human population residency (POP).

These categories ~~were~~ are indexed to one of these 3 distribution methods as follows:

IN-OUT: Landfills, Publicly-Owned Treatment Works (POTW), Treatment, Storage, and Disposal Facilities (TSDF), Industrial Waste Treatment, Catastrophic/Accidental Releases, Feed Lots, and Aircraft flights and their maintenance.

The activity of these categories are linked to the actual location of each event or facility. When one of these sites falls inside the domain, all the emissions from that site ~~were~~ are attributed to the domain. Conversely, when a site falls inside a given county but *outside* the domain, no emissions ~~were~~ are assigned to that portion of that county that resided in the domain. ~~For a~~Aircraft *maintenance* emissions ~~were~~ are presumed to occur on, or very near, the airport property so these emissions ~~were~~ are effectively located at the airport itself.

LAND: Accidental Releases, Agricultural Burning, Agricultural Crop Harvesting, Agricultural Land Preparation, Asphalt, Biogenics, Firefighter Training Fires, Leaking Underground Storage Tanks, Open Fires from Forest and Range Fires, Orchard Heaters, Pesticide Application, Railroad Activity, Road Construction, Traffic Markings, Unpaved Farm Roads, and Unpaved Non-farm Roads.

The activity surrogate for these categories are closely linked to the total land area of each county falling inside the domain: presumed linear to the land available. For example, in calculating railroad activity a linear relationship ~~was~~ is applied since *more* acreage requires *longer* rail track lines requiring *more* diesel fuel to move rail freight. The emissions from the diesel consumed by each railroad company in each county ~~was~~ is retained on a countywide basis, then a simple land-area apportionment ~~was~~ is used to distribute each county's railroad emissions to the area falling inside the domain's portion of that county. The distribution of *LAND* ~~was~~ is determined by GIS (Global Information System) mapping. This mapping ~~was~~ is completed (or managed) by Patrick Barickman of UDAQ.

POP: Drycleaning, Industrial and Architectural Surface Coatings, Solvent Cleaning, Auto Body Refinishing, Solvent Use, Tank Cleaning, Bakeries, Breweries, Charcoal Grilling. Wood, Coal, Oil, Natural Gas, Misc Non-Road Engines, and Structure and Vehicle Fires, Open Burning by Permit.

The activity of these categories are most-closely linked to the needs of people as they provide hot water and space-heating to their homes, maintain their homes, cars, and health, and use recreational equipment. The distribution of *POP* ~~was~~ is determined by equation, as detailed below.

$$\textbf{Pop IN} = [[\ (\ \textbf{Land IN}\ \times\ \textbf{Balance}\ )\ +\ \textbf{known IN}\ ]\ /\ \textbf{All Pop}\ ]\ \textbf{x 100}$$

Definition Of Terms in Equation:

Land IN, (%) = The percentage of each county that lies within the domain as measured by conventional GIS techniques. Interior counties are always 100% within the domain while border-counties are less than 100% because they are trimmed by the domain's boundary line. GIS results are as follows:

AREA IN DOMAIN			
County	Total Sq. Km.	Area in Domain	% in Domain
Box Elder	17456	3869	22%
Cache	3040	1253	41%
Carbon	3844	43	1%
Davis	1644	1644	100%
Emery	11546	17	0%
Juab	8821	2794	32%
Morgan	1581	1581	100%
Rich	2812	808	29%
Salt Lake	2086	2086	100%
Sanpete	4147	660	16%
Summit	4867	1552	32%
Tooele	18871	5961	32%
Utah	5544	5150	93%
Wasatch	3129	1159	37%
Weber	1708	1708	100%

Known IN, (numeric value) = The number of people residing in all towns and cities that are known to lie inside the domain-portion of a given county. Populations ~~were~~ are taken from the *U.S. Bureau Of The Census, Subcounty Population Estimates*, published June 30, 1999.

Known OUT, (numeric value) = The number of people, listed by census, of all towns and cities that are known to lie outside the domain-portion of a given county.

Balance, (numeric value) = The number of people, listed by census, residing in a given county that do not hold residency in any listed town or city of that county. These people are presumed to reside in the "unincorporated" areas of the county. Since no further easily-assessable information is known about their residency, they are presumed to reside uniformly over the entire county, some residing inside and some outside the domain. The following table lists the population of each town and city in the **Known IN** area followed by the **Balance** population.

1996 Population

Source: Governor's Office of Planning and Budget

Box Elder		Cache		Juab		Summit	
County Total	***40072***	*County Total*	***84429***	*County Total*	***7044***	*County Total*	***24488***
* Bear River City	800	* Hyrum	5460	* Eureka	630	* Coalville	1288
* Brigham City	16764	* Millville	1364	* Mona	820	* Francis	694
* Corinne	681	* Nibley	1480	* Nephi	4252	* Kamas	1462
* Deweyville	344	* Paradise	711	**SUBTOTAL**	**5702**	* Oakley	845
* Elwood	647	* Wellsville	2808	Levan	470	* Park City	6229
* Honeyville	1243	**SUBTOTAL**	**11823**	**BALANCE**	**872**	**SUBTOTAL**	**10518**
* Mantua	684	Amalga	473			Henefer	678
* Perry	1497	Clarkston	664			**BALANCE**	**13292**
* Willard	1470	Cornish	205	**Morgan**		**Tooele**	
SUBTOTAL	**24130**	Hyde Park	2693	*County Total*	***6798***	*County Total*	***30096***
Fielding	435	Lewiston	1546	* Morgan	2420	* Grantsville	5198
Garland	1798	Logan	39415	**SUBTOTAL**	**2420**	* Rush Valley	367
Howell	268	Mendon	771	**BALANCE**	**4378**	* Stockton	467
Plymouth	280	Newton	710			* Tooele	14996
Portage	221	North Lagon	5769			* Vernon	199
Snowville	267	Providence	4032	**Rich**		* Wendover	1190
Tremonton	4786	Richmond	1991	*County Total*	***1852***	**SUBTOTAL**	**22417**
BALANCE	**7887**	River Heights	1328	**SUBTOTAL**	**0**	Ophir	30
		Smithfield	6820	Garden City	228	**BALANCE**	**7649**
		Trenton	468	Laketown	271	**Wasatch**	
		BALANCE	**5721**	Randolph	517	*County Total*	***12283***
				Woodruff	146	* Charleston	424
				BALANCE	**690**	* Heber	5403
						* Midway	2174
						* Wallsburg	316
						SUBTOTAL	**8317**
						BALANCE	3966

Balance = Population not in cities in entire county
Subtotal = Population in cities in domain
*In the domain

All Pop, (numeric value) = The total human population, listed by census, of any given county.

Pop IN, (%) = The percentage of people estimated to live inside the domain's portion of any given county. This is a calculated value using the above equation.

For counties interior to the domain, the **Land IN** is always 100%, therefore the total human population of its towns, cities, and unincorporated parts will always sum to the county's full population. Notice that **Known OUT**, the number of people known to reside in the county but outside the domain, is not listed within the equation, above.

Apportionment Of 1996 Winter Day Emissions

After the *annual* domain apportionment is complete, the typical winter day and the episode days apportionment will be calculated either by SMOKE or by UDAQ. The SMOKE preprocessor will apportion the annual emissions into typical winter day. UDAQ will use the defaults contained in SMOKE for all categories except for categories that do not fit the defaults within the software. These categories are indicated in the following sections.

Projecting area source emissions

The following basic equation will be used to project area sources:

Projection year emissions = (base year emissions) X (growth factor) X (control factor)

The base year emissions will be based on typical winter inversion day meteorology. The typical inversion day includes snow cover, cold temperatures, and fog. Explanations on how this effects the various category emissions are included in the area category sections.

The growth factors will be based on the growth indicators listed in EIIP Volume 10 Table 13.1-1 with the exception of POTWs, gasoline marketing and municipal solid waste landfills. Population growth is used to project these emissions.

5.1 GASOLINE DISTRIBUTION

Calculation of Annual Emissions

Evaporative emissions are released any time a petroleum liquid is disturbed. This category estimates VOC losses beginning the moment refined fuels are loaded for distribution at each refinery until those fuels occupy individual vehicle tanks at a service station. Motor fuel consumption by month for the entire state of Utah is provided by the Utah State Tax Commission. The fuel consumption is then allocated to each county by population.

The fuel distribution process is divided into five distinct phases. Vapor loss occurs during each phase. These phases are:

(1) The loading of fuel at bulk terminals,
(2) The transport of fuel in tank trucks,
(3) The transfer of fuel from tank trucks to service station storage tanks,
(4) The breathing loss of fuel at service stations, and
(5) The transfer of fuel from service station tanks to private vehicle tanks.

A comprehensive discussion of the emissions from the first four phases is contained in Volume III Chapter 11 of the EIIP. Estimates of gasoline delivery emissions will be calculated using Method 1 of the above reference.

Emission factors for gasoline trucks in transit, fuel delivery to outlets, and storage tank breathing are all provided by EPA. No methodologies have been identified to replace the use of these emission factors. These emission factors are listed in the table below. Emission factors for vehicle refueling will be developed through the use of EPA's MOBILE model. This software uses local data (e.g., temperature, fuel volatility) to generate a custom VOC emission factor.

VOC EMISSION FACTORS FOR GASOLINE MARKETING ACTIVITIES [a]

Emission Source	mg/Liter Throughput	lb/1000 gal Throughput
Gasoline Tank Trucks in Transit		
Empty Tank Trucks [b]	6.5	0.055
Full Tank Trucks [c]	0.5	0.005
Filling Underground Tank (Stage I)		
Submerged Filling	880	7.3
Splash Filling	1,380	11.5
Balanced Submerged Filling	40	0.3
Underground Tank Breathing	120	1.0

a Source: AP-42 Tables 5.2-5, 5.2-7.
b Midpoint of typical range provided in AP-42. Under extreme conditions, the upper end of the range is 0.37 lb/1000 gal (44.0 mg/L).
c Midpoint of typical range provided in AP-42. Under extreme conditions, the upper end of the range is 0.08 lb/1000 gal (9.0 mg/L).

Calculation of episode day and typical winter-day emissions

Episode day and winter season day emissions will be calculated by SMOKE .

Calculation of projection emissions

The growth factor in the projection equation will use the VMT growth rate. (See Projecting Area Source

Emissions under Section 5, Area Source Emissions Data).

5.2 DRY CLEANING

~~Dry cleaners were surveyed and inspected statewide. Only one dry cleaner has significant emissions. This source is included in the point source emissions inventory.~~

Calculation of Annual Emissions

Emissions of VOC from dry cleaning operations are calculated using Method 2, from Volume III, pages 5-7 through 5-8 (Attachment 1), which uses an emission factor to calculate emissions based on population. In early 1996, the EPA amended their view by excluding perchloroethylene from the definition of a VOC on the basis that it has negligible photochemical reactivity (ref. 61 FR 4588, dated 2/7/96).

	Emission Factor
Stoddard solvent	0.36 lb/yr/capita
Commercial perchloroethylene	negligible
Self-service perchloroethylene	negligible

The county populations are obtained from the Utah Governor's Office of Planning and Budget. There are no dry cleaning facilities reported as point sources in the Utah State Emission Inventory report.

(population) x (0.36 lb VOC / yr / capita) / (2000 lb/ton) = VOC tons / yr

Calculation of episode day and winter-day emissions

Episode day and winter season day emissions will be calculated by SMOKE.

Calculation of projection emissions

Human population will be used as the indicator for the growth factor in the projection equation. (See Projecting Area Source Emissions under Section 5, Area Source Emissions Data) .

5.3 SOLVENT CLEANING (Previously named Surface Cleaning - Degreasing Emissions)

Calculation of Annual Emissions

The method used to calculate emissions from this process ~~was~~ is per capita as presented as the Alternative Method in Volume III Chapter 6 of the EIIP.

The emissions factors included in this category are:

Automobile Repair	2.5 lb/yr/person
Electronics and Electrical	0.21 lb/yr/person
Other	0.49 lb/yr/person
TOTAL	3.2

The manufacturing portion of this category is accounted for in the point source emissions. The 1.1 lb/capita factor for manufacturing ~~was~~ is deducted from the total 4.3 lb/capita factor resulting in a factor of 3.2 lb/capita. The county populations ~~were~~ are obtained from the Utah Governor's Office of Planning and Budget.

The equation ~~that was used~~ is:

(population) x (3.2 lb VOC/yr/capita) / (2000 lb/ton) = VOC tons/yr

Solvent cleaning emission factors include emissions from all solvent cleaning except manufacturing. (EIIP Volume 6 Chapter 5 Table 6.5-2) Emissions from solvent cleaning at automobile repair and electronic and electrical point sources will be subtracted from the category emission total to prevent double counting.

Calculation of episode day and winter-day emissions

Episode day and winter season day emissions will be calculated by SMOKE.

Calculation of projection emissions

Industrial employment will be used as the indicator for the growth factor in the projection equation. (See Projecting Area Source Emissions under Section 5, Area Source Emissions Data) .

5.4 SURFACE COATINGS

5.4.1 INDUSTRIAL SURFACE COATING

Calculation of annual emissions

The UDAQ has not previously included the category of Industrial Surface Coating Emissions in the area inventory. This category is included in the EIIP and will be calculated on a per capita basis using the industrial emission factors included in the current guidance. The emission factors are as follows:

Furniture and Fixtures	2.0 lb/capita/yr
Metal Containers	1.3 lb/capita/yr
Machinery and Equipment	1.1 lb/capita/yr
Appliances	0.2 lb/capita/yr
Other Transportation Equipment	0.2 lb/capita/yr

Sheet, Strip, and Coil	0.5 lb/capita/yr
Factory Finished Wood	0.3 lb/capita/yr
Electrical Insulation	0.1 lb/capita/yr
Other Product Coatings	0.6 lb/capita/yr
High-Performance Maintenance Coatings	0.8 lb/capita/yr
Other Special Purpose Coatings	0.8 lb/capita/yr
TOTAL	7.9 lb/capita/yr

The emission factor for "Automobiles (new)" and Marine Coatings ~~were~~ is deleted from the EIIP list because there are no automobile manufacturing companies in Utah.

County populations are obtained from the Utah Governor's Office of Planning and Budget.

(Population) x (7.9 lb VOC/yr/capita) / (2000 lb/ton) = VOC tons/yr

Surface Coating emission factors include emissions from all surface coating in the domain. Emissions from surface coating occurring at point sources within the domain will be subtracted from the category emission total to prevent double counting.

Calculation of episode day and typical winter-day emissions

Episode day and winter season day emissions will be calculated by SMOKE using annual emissions.

Calculation of projection emissions

Population will be used as the indicator for the growth factor in the projection equation. (See Projecting Area Source Emissions under Section 5, Area Source Emissions Data).

5.4.2 TRAFFIC MARKINGS (Previously included under non-industrial surface coating)

Traffic marking operations consist of marking of highway center lines, edge stripes, and directional markings and painting on other paved and unpaved surfaces, such as markings in parking lots. Materials used for traffic markings include solvent-based paints, water-based paints, thermoplastics, preformed tapes, field-reacted materials, and permanent markers. Solvent-based formulations of alkyd resins or chlorinated rubber resins are the most commonly used traffic paints. This category focuses on applications of traffic paints that emit a significant quantity of volatile organic compounds (VOCs). The use of traffic paints is entirely an area source.

Traffic paints are applied by maintenance crews or by contractors during new road construction, resurfacing, and other maintenance operations. The method of application is usually a spray.

The paints are subjected to harsher conditions than most other paints and must withstand wear from tires, rain, sun, and other environmental factors for a considerable period of time. Solvent- and water-based paints have roughly the same durability, with both beginning to deteriorate about a year after their application. Both solvent- and water-based paints must be applied in dry conditions and at temperatures above 40 °F. If applied properly, water-based paint is considered to be of better quality than solvent-based paint; however, application of water-based paint is more susceptible to weather constraints such as humidity. Plastic-based paints (i.e., thermoplastics, preformed tapes, and field-reacted systems) are more durable than either solvent- or water-based paints.

Calculation of annual emissions

VOC emissions result from the evaporation of organic solvents during and shortly after the application of the marking paint. Of the painting materials commonly used for traffic marking, three types emit VOCs in appreciable amounts:

- Nonaerosol traffic paint, water- and solvent-based: Solvent-based paints include eliphatic hydrocarbons, toluene, xylene, ketones, and chlorinated hydrocarbons. Water-based paints contain some organic solvent components, usually emulsions of glycols and alcohols; however, the VOC emissions are considerably lower than those from solvent-based paints.

- Aerosol marking paint, water- and solvent-based: These paints are used to apply stripes or markings to outdoor surfaces, such as streets, golf courses, athletic fields, or construction sites. Markings can be either temporary or permanent. Section 5.8, *Consumer and Commercial Solvent Use*, includes an emission factor of 0.0254 lb/person for the use of these products. Total annual emissions in the U.S. for this subcategory are estimated as 3,154 tons of reactive VOC per year. Emissions from these paints are not included in this section.

- Preformed tapes applied with adhesive primer: Emissions from traffic marking adhesives are included as part of Section 5.8, *Consumer and Commercial Solvent Use*, under the subcategory of "other adhesives." Emissions from these adhesives are not included in this section.

VOC emissions are negligible from application of some alternative paints including thermoplastics, preformed tapes with no adhesive primer, and two-component, field-reacted systems. In addition to the painting material used, VOCs from solvents utilized in cleaning the striping equipment is quantified in this category.

UDAQ will be using Alternative Method 2 in Volume III, Chapter 14 of EIIP to calculated emissions from this category. This method uses an emission factor for lane miles of road painted paired with local data. The emission factors are from a 1988 Control Technology Center (CTC) report (EPA, 1988). Emission factors for solvent- and water-based traffic paints, and for lane miles painted or total lane miles are shown below.

Utah Department of Transportation will provide the number of lane miles in each county, allowing UDAQ to utilize this method. The national default factor for typical annual emissions, in units of pounds per mile and year will be

used. The emission factors for solvent-based paints will be used if information about the proportions of solvent-based versus water-based paint is not available. This will result in the most conservative estimate. However, UDAQ would prefer to gather information about the proportions of solvent-based versus water-based paint if at all possible.

The equation used to calculate emissions using these emission factors is:

Inventory Area Emissions from Traffic Paints =	Emission Factor (lb/mile-year)[a]	*	Traffic Lane miles

The method does not take into account any region-specific use of lower-emitting coatings, such as water-based coatings or thermoplastic tapes. Using the typical annual emissions factor with total lane miles also will not reflect area-specific repainting schedules.

LANE MILE VOC EMISSION FACTORS (EPA, 1988)

Traffic Paint Type	Typical Expected Life (years)	Typical Annual VOC Emissions (lb/mile-year)[a]
Solvent-based	0.75	69
Water-based	1.0	13

Calculation of episode day and winter-day emissions

The temperature during the episode days was never above 55 °F. Therefore, no traffic marking activity is assumed.

Calculation of projection emissions

It is ~~also~~ assumed that any future winter episode will have similar temperatures; therefore, no traffic marking emissions will be included in the projection inventory.

5.4.3 ARCHITECTURAL COATING

Calculation of annual emissions

There are several methodologies available for calculating emissions from architectural surface coatings. The

method used is dependent upon the degree of accuracy required in the estimate, available data, and available resources. Since architectural surface coatings can be the largest single area source of VOCs in some metropolitan areas, this category warrants the time and effort needed to calculate emission estimates for it.

Most VOC released by these coatings are from the evaporation of VOCs (i.e. drying process) contained in the coating, coating thinners, and thinners used for cleanup. Determining the amount of the VOC in coatings and thinners provides a good estimate of the VOC emitted by this source category. This estimating can be done by survey or population-based estimation methods.

There may be cases when emission estimates from this category may be estimated as one of many processes occurring at a point source for the purposes of permitting and emission tradeoffs. These emissions will be identified and subtracted from the area source estimates.

UDAQ will use the alternative method outlined in Volume III, Chapter 3 of EIIP for calculating emissions from architectural surface coating using population-based usage and emission factors. The procedure is as follows:

- Determine the per capita usage factor by dividing the national total architectural surface coating quantities for solvent and water based coatings by the U.S. population for the inventory year.
- Determine the VOC emission factors for solvent- and water-based coatings. Emission factors based on weighted averages from a 1990 survey study are listed below. These emission factors are based on the weighted average VOC emission at maximum thinning.

The per capita usage factor is calculated by dividing the total usage of solvent based paints by the U.S. population, and the total usage of water based paint by the U.S. population.

Per Capita Solvent
Based Usage Factor = Gallons of Solvent Based Paints/Population.
= 146,301,000/248,709,873
= 0.59 gallons per person

For water based paints:

Per Capita Water
Based Usage Factor = Gallons of Water Based Paints/Population.
= 452,506,000/248,709,873
= 1.82 gallons per person

This figure will be updated for each periodic inventory and the emission factors recalculated.

Architectural surface coating emission factors include emissions from all architectural surface coating in the domain. Emissions from architectural surface coating occurring at point sources within the domain will be

subtracted from the category emission total to prevent double counting.

Calculation of episode day and winter-day emissions

The use of architectural surface coatings is influenced by the seasons since spreading and drying characteristics for many paints are dependent on the temperature. Temperatures below 50°F are not suitable for painting, and limit activity. Some painters work around this problem by heating the rooms in which they paint. Regardless, overall activities are restricted. Episode day and winter season day emissions will be apportioned by SMOKE using annual emissions and defaults.

Calculation of projection emissions

Population will be used as the indicator for the growth factor in the projection equation. (See Projecting Area Source Emissions under Section 5, Area Source Emissions Data).

5.4.4 AUTO BODY REFINISHING

Calculation of annual emissions

Auto body refinishing is the repairing of worn or damaged automobiles, light trucks, and other vehicles, and refers to any coating applications that occur subsequent to those at original equipment manufacturer (OEM) assembly plants. (Coating of new cars is not included in this category.) This category covers solvent emissions from the refinishing of automobiles, including paint solvents, thinning solvents, and solvents used for surface preparation and cleanup.

Auto body refinishing shops range in size from small shops having less than five employees to volume or "production" shops with over ten employees. Data from 1987 show that the typical refinishing shop employs six persons and performs an average of 13 jobs per week.

Most auto refinishing jobs are performed as part of a collision repair and involve only a small portion of a vehicle, such as a panel or a spot on a panel ("spot" repair). About 17 percent of refinishing jobs involve the entire vehicle. For a typical shop, approximately 90 percent of the work consists of spot and panel repairing, and the entire vehicle is completely refinished only about ten percent of the time. Shops specializing in repainting entire automobiles are referred to as "production" shops.

Auto body refinishing shops may be area or point sources, but the majority of shops are considered area sources of emissions. Point source emissions must be subtracted from total emissions to produce an estimate of auto body refinishing area source emissions.

UDAQ will use Alternate Method 3 of Volume III, Chapter 13 of EIIP to calculated these emissions. This

method multiplies population in the inventory area by a per capita VOC emission factor to estimate emissions:

$$E_a = Pop_a \times EF$$

where: E_a = emissions for the area
Pop_a = area population
EF = per capita VOC emission factor

The county populations ~~were~~ are obtained from the Utah Governor's Office of Planning and Budget. The per capita VOC emission factor of 2.3 pounds per year, recommended in EIIP, will be used. UDAQ will subtract any point source emissions for this category from the emissions total generated using the above equation.

Calculation of episode day and winter-day emissions

EPA reports that auto body refinishing emissions do not demonstrate differences in activity from season to season. ~~However, other references have indicated that since there is a direct relationship between auto body refinishing activity and number of automobile accidents, if there is a seasonal difference in accident occurrence, the same seasonal variation may be seen in auto body refinishing activity. UDAQ will review annual accident statistics from the National Safety Council and/or survey results to determine if any seasonal variability exists for the domain area.~~ Episode day and winter season day emissions will be apportioned by SMOKE using annual emissions.

Calculation of projection emissions

Industrial employment will be used as the indicator for the growth factor in the projection equation. (See Projecting Area Source Emissions under Section 5, Area Source Emissions Data).

5.5 GRAPHIC ARTS

Calculation of annual emissions

Emissions of VOC from graphic arts facilities ~~was~~ is estimated by using Alternative Method 2 outlined in Volume III Chapter 7 of the EIIP. An emission factor of 1.3 pounds of VOC/capita/year ~~was~~ is applied. The county populations ~~were~~ are obtained from the Utah Governor's Office of Planning and Budget. To avoid double counting, any identified graphic art point source emissions with VOC emissions of less than 100 ton/year will be subtracted out as outlined in the EIIP guidance. The emission factor is independent of facilities with emissions greater than 100 tons/year in the inventory area.

(population) x (1.3 lb/VOC/yr/capita) / (2000 lb/ton) = VOC ton/yr.

Calculation of episode day and winter-day emissions

There are no dramatic seasonal fluctuations in production in the graphic arts industry; therefore, it can be assumed that emissions are distributed uniformly throughout the year. Therefore, episode day and winter season day emissions will be apportioned by SMOKE using annual emissions.

Calculation of projection emissions

Population will be used as the indicator for the growth factor in the projection equation. (See Projecting Area Source Emissions under Section 5, Area Source Emissions Data).

5.6 ASPHALT PAVING (Previously named Cutback Asphalt Use)

Calculation of annual emissions of cutback

Emissions of VOC from cutback asphalt used in Utah ~~were~~ are estimated by first determining total annual cutback asphalt usage per county, in tons/year. This information ~~was~~ is obtained from the Utah Department of Transportation. The values ~~were~~ are then converted to kg/year (2000 lb/ton, 0.45 kg/lb). Other providers of asphalt ~~were~~ are not taken into consideration. This oversight will be corrected for the PM_{10} SIP inventory. The manufacture of cutback asphalt at point sources will be assumed to be placed in the county in which it is produced.

Medium cure cutback asphalt (MC) is primarily used in Utah, along with small amounts of high cure cutback asphalt (HC). The densities for both asphalt types ~~were~~ are obtained from AP-42 Section 4.5. Rapid cure cutback evaporative losses are estimated at 95% by weight of diluent. Medium cure evaporative losses are estimated at 70% by weight of diluent, and slow cure at 25 percent by weight of diluent. This information ~~was~~ is used to calculate the volume of diluent used for each type of asphalt.

As a first step, the weight of asphalt applied is converted from tons to kg.

W_T and W_D = Total weight of asphalt and weight of diluent
V_D and V_C = Volume of diluent and cement
D_D and D_C = Density of diluent and cement
P_D = Percent diluent by volume

From AP-42: $W_T = V_D D_D + V_C D_C$
and $V_D = P_D(V_D + V_C)$

Solving these equations for V_D:

Asphalt Type	D diluent	D cement	P (% diluent)
Medium Cure	0.8 kg/*l*	1.1 kg/*l*	35%
Rapid Cure	0.7 kg/*l*	1.1 kg/*l*	45%

The diluent is the source of VOC emissions. The total weight of diluent ~~was~~ is determined to be:

$$W_D = V_D D_D$$

Volume III Chapter 17 of the EIIP gives the evaporative losses as 70% of medium cure diluent and 95% of rapid cure diluent. Therefore, medium cure emissions equal:

$$W_{VOC} \text{ from MC asphalt} = W_D \ (0.70)$$
$$W_{VOC} \text{ from RC asphalt} = W_D \ (0.95)$$

As a final step, kg/yr VOC is converted to tons/year VOC.

Calculation of typical winter and episode-day emissions

Cutback asphalt application is prohibited in Salt Lake and Davis Counties except from October 1 to April 30 per the Utah Air Conservation Rules R307-341. The temperatures during the episode days were less than 50 ^{o}F. Asphalt is not placed when the ambient air temperature is under 55 ^{o}F; therefore, no asphalt emissions are included in the episode or projection inventories.

5.6a ~~EMISSIONS FROM~~ EMULSIFIED ASPHALT USE

Emissions of VOC from emulsified asphalt ~~were~~ are determined to be zero or negligible. This was determined after discussing the matter with Cameron Petersen, the Lab Specialist at the head office of the Utah Department of Transportation. In summary, the soap used by UDOT does not contain volatile organic compounds. The same is true of independent contractors using emulsified asphalt within the emissions area.

5.7 COMMERCIAL & CONSUMER PESTICIDE APPLICATION

Calculation of annual emissions

Pesticides are substances used to control nuisance weeds (herbicides), insects (insecticides), fungi (fungicides),

and rodents (rodenticides). Pesticides can be broken down into three chemical categories: synthetics, nonsynthetics (petroleum products), and inorganics. Formulations of pesticides are made through the combination of the pest-killing material referred to as the active ingredient, and various solvents (which act as carriers for the pest-killing material) referred to as the inert ingredient. Both types of ingredients contain VOC that can potentially be emitted to the air either during application or as a result of evaporation.

The pesticide applications occur only during the area's growing season. The domain has a growing season of 184-days.

Calculation of typical winter and episode-day emissions:

The 184-day growing season does not occur during the winter season. Therefore, it is assumed that no emissions occur~~red~~ during ~~the~~ episode days. Therefore, no emissions from pesticides will be included in the projection inventory.

5.8 COMMERCIAL/CONSUMER SOLVENT USE

Calculation of annual emissions

The VOC emissions from commercial and consumer solvents are determined by using the per-capita method described in Volume III Chapter 5 of the EIIP. County population statistics are obtained from the Utah Governor's Office of Planning and Budget. Previously the annual emission factor of 6.3 lbs of VOC emitted per capita was applied. However, some of the product categories and emission factors have been updated by the current EPA guidance. The new proposed annual emission factor of 6.06~~7.84~~ pounds of VOC per capita will be used to calculate emissions from this category. The ~~7.84~~ 6.06 lb per capita covers:

Personal Care Products	2.32 lb/capita/year
Household Products	0.79 lb/capita/year
Automotive Aftermarket Products	1.36 lb/capita/year
Adhesives and Sealants	0.57 lb/capita/year
Coatings and Related Products	0.95 lb/capita/year
Miscellaneous Products	0.07 lb/capita year
Total	6.06 lb/capita/year

UDAQ has a category for pesticides which are FIFRA-Regulated Products. This has been removed from this category to avoid double counting between two area source categories: Commercial/consumer solvent use and pesticide application.

The following equation ~~was~~ is used to determine annual VOC emissions:

(population) x (6.06 lb VOC/capita/yr) / (2000 lb/ton) = VOC tons/yr.

Calculation of episode day and typical winter-day emissions:

Episode day and winter season day emissions will be apportioned by SMOKE using annual emissions.

Calculation of projection emissions

Population will be used as the indicator for the growth factor in the projection equation. (See Projecting Area Source Emissions under Section 5, Area Source Emissions Data).

5.9 WASTE MANAGEMENT PRACTICES

5.9.1 TREATMENT, STORAGE, AND DISPOSAL FACILITIES (TSDFs)

The emission inventory should include estimated VOC emissions from any existing TSDFs in the domain. In a February 24, 1993, letter from Tim Russ, EPA Region VIII, to UDAQ, EPA provided assistance in identifying and estimating VOC emissions from TSDFs. Following EPA guidelines UDAQ identified and inventoried all TSDFs. All of these sources are included in the point source inventory.

Calculation for winter and episode-emission day

There are no area source emissions for this process.

5.9.2 ESTIMATE OF VOC EMISSIONS FROM INDUSTRIAL WASTEWATER TREATMENT

All VOC emissions from existing on-site wastewater treatment facilities within a stationary point source ~~were~~ are included as part of the stationary point source VOC emissions.

Calculation for episode-emission day

The emissions are ~~considered to be~~ reported under the point source emissions.

5.9.3 ~~ESTIMATE OF VOC EMISSIONS FROM~~ PUBLICLY OWNED TREATMENT WORKS (POTWs)

Calculation of annual emissions

As suggested in "Quality Review Guidelines for 1990 Base Year Emission Inventory" EPA 450/4-91-022,

September 1991, page 4-7, the SIMS model was used in accordance with the guidance in the "Background Document for the Surface Impoundment Modeling System (SIMS) Version 2.0, EPA -450/4-90-019b to estimate VOC emissions from POTWs.

There are a total of six POTWs in Salt Lake and Davis Counties, serving the needs of the majority of people and industries within the domain. ~~This number was originally obtained from Mary Deloretto, engineer with the Utah Division of Water Quality and later verified by POTW representatives. All six facilities were contacted and the minimum data obtained from each POTW to run the SIMS model and produce the estimated VOC emissions from each POTW~~. Fluid type, flow rate, and any other relevant specifications are obtained from the managers of these six POTWs, then VOC levels are calculated for each POTW with the SIMS model from those specifications. Since emissions from any single POTW are relatively low, a factor is calculated by dividing the collective VOC emissions of these six POTWs by their collective daily flow rates, creating a ratio that is applied to the other POTWs in the remaining parts of the domain.

~~The selection of the industry categories that comprise the percent industrial contribution was provided by the POTWs.~~

~~The SIMS model calculates VOC emissions based on percent industrial contribution to total wastewater flow. Because Central Davis County Sewer District reported 0% industrial contribution, the model could not be run for this source, and emissions are reported as zero.~~

~~A survey will be conducted to find any additional POTW's in the domain. Data to run the SIMS model will be gathered for any additional facilities and emissions will be included in the modeling process.~~

Calculation of typical winter-day emissions:

Although POTW equipment operates seven days a week, the industrial waste yields most of the VOC emissions. For this reason, emissions are distributed over 6 days per week year-round.

(VOC tons/year) / (312 days/year) = VOC tons/day

Calculation for episode-emission day

The emissions are considered the same as an average winter day except for the Sunday episode day. Emissions are considered to be zero on Sunday because of the operation schedule of this type of process. Although, POTW receive household waste on Sunday, industrial waste is negligible. Since industrial waste is the major cause of VOC emissions, the six-day emission schedule is assumed.

Calculation of projection emissions

The growth factor in the projection equation (see Projecting Area Source Emissions under Section 5, Area

Source Emissions Data) will use population as the indicator. This is contrary to the growth indicator specified in the EIIP Volume 10 Table 3.1-1. Projected site specific information is not available at this time.

5.9.4 MUNICIPAL LANDFILLS

Calculation of annual emissions:

An estimate of the amount of waste in place in 1996 for all the landfills in Utah was gathered for the Code of Federal Regulations (CFR) Part 40 Subpart 61 Section WWW regulation. This data will be used to determine the episode day inventory.

Large landfills will be inventoried as point sources in the future.

Future estimates of emissions from medium-sized landfills will be calculated using alternative method 1 of Volume III Chapter 15 of EIIP.

This method is a set of decision-making rules to follow for data collection of landfill waste in place and landfill opening and closure dates used in the AP-42 equation or the LAEEM and assumptions to use when local data are not available.

The landfills in the inventory area will be identified by reviewing the inventory done for 40 CFR Subpart 61 Section WWW. UDAQ will decide which of the smaller landfills in the domain emitted emissions significant enough to warrant the effort needed to produce emission estimates from them. Waste in place estimates will be made using either the LAEEM utility for estimating refuse in place or determine weight and converting this to volume using AP-42 equations.

This alternative method will allow UDAQ the opportunity to prepare fairly reliable estimates for the largest landfills in the inventory area and more uncertain and more conservative estimates for the smaller landfills.

Calculation of typical winter and episode -day emissions:

Landfill emissions ~~were~~ are assumed to be a uniform activity; therefore, episode day and winter season day emissions will be apportioned by SMOKE using annual emissions.

Calculation of projection emissions

Population will be the indicator of the projected increase in waste. The increase in emissions from this waste shall be calculated using the landfill model.

5.10 LEAKING UNDERGROUND STORAGE TANKS (LUST)

Utah Division of Emergency Response and Remediation track the leakage and replacement of above and below ground fuel storage tanks statewide by county. That office routinely reports *remediation starts* to us, marking the beginning of a multi-month cleanup process.

The process that was done for the 1996 ozone periodic inventory will be repeated for the PM_{10} SIP inventory.

An estimate of the 1996 VOC emissions from the LUST sites located in the domain will be determined using the method set forth in the memorandum dated May 5, 1992 from Glen Rives and Lauren Elmore of Radian.

A report of the remediation activities in the domain will be supplied by the Utah Division of Environmental Response and Remediation (DERR). The Division of Air Quality will look at the date by which DERR approved a contractors corrective action plan, (CAP) for a particular site and use this as an indicator of the projects initiated during the episode days. This assumption is made due to the difficulty in pinpointing the actual start or completion date of each remediation.

According to R307-413-8, Utah Air Conservation (UACR), De Minimis Emissions from Air Strippers and Soil Venting Projects, no person can conduct a soil decontamination project without a permit unless the emissions from that project are equal to or less than 1.5 tons per year of total hydrocarbons. Mr. Tim Blanchard of our staff reviews the soil remediation projects sent to us by DERR. He informed the inventory staff that the majority of those remediations reviewed were below 1 ton of emissions per project. Based on that information, ~~plus that found in R307-6, UACR, it will be assumed~~ UDAQ assumes that each site emits 1.5 tons of VOCs per project per year. This conservative estimate should account for the diminutive number of projects for which emissions may have exceeded the 1.5 ton per year allowed.

In an attempt to make the emissions calculations more accurate, the following additional information will be obtained from DERR to expand the calculation:

1) According to data supplied to EPA by several states covering the types of on-site technologies typically used at LUST sites, it ~~was~~ is estimated that 80% of the emissions resulting from these on-site technologies ~~were~~ are emitted into the air. This is expressed as .8 in the calculation.

2) The database used by DERR has been expanded since the base year inventory was prepared, and is now used by all of the project managers in the LUST section. Therefore, the database will be used to determine the total number of remediations initiated per year.

3) The average number of days a project will last will be determined using the worst case scenario of 1.5 tons per project per year (above this limit and the source needs a permit to remediate), and the 28 lbs/day default factor found in the May 15, 1992 memo. Note: the 1.5 emission limit can be found in R307-~~6~~413-8 and 9, De Minimis Emissions from Air Strippers and Soil Venting Projects. This calculation will be made to document that both the 1.5 limit found in the UACR and the 28 lb limit from the May memo are high estimates for this category.

4) To determine emissions for a episode day the total emissions for the season will be divided by 120, the number of days encompassed by the 1996 winter season.

The following calculation ~~was~~ is performed to verify that ~~the 1.5 tons/project/yr found in R307-6 and~~ the 28 lbs/day default factor from the May 15, 1992 memo ~~are~~ is a high estimate~~s~~ of emissions for these projects. The tracking sheet indicates that many of these projects last ~~well~~ over a three-month period. Each project lasts at least:

(1.5 tons/project) x (2,000 lbs/ton) / (28 lbs/day) = 107 days/project.

Calculation for episode-emission day

The emissions will be estimated depending on any leaks occurring on the episode days per DERR files.

Calculation of projection emissions

The emissions from this category will be minimal due to the under ground storage tank rule (40 CFR 280) which required the replacement of numerous underground storage tanks by December 22, 1998. Due to good compliance to this rule, no emissions are expected from this category.

5.11 STATIONARY EXTERNAL COMBUSTION

5.11.1 ORCHARD HEATERS

The *Utah Fruit Growers Association* has reported steady-to-sharp decline in the use of orchard heaters from the early 1980s to the present. Prior to this decline, orchard heaters were only used marginally during their peak, usually during the early spring. Further, suburban sprawl has claimed most of the orchards and plantation farms throughout the Wasatch Front counties. Yet further, California (and other out-of-state) growers supply an increasing-large part of Utah's needs and newer technology replaces "smudge pots" and old-style oil-burning orchard heaters with fans or wind machines. For these reasons, statewide annual use ~~was~~ is estimated at zero.

Calculation for episode day and winter day emissions

The emissions are considered to be zero.

5.11.2 WOODBURNING/FIREPLACES

5.11.2a SPATIAL ALLOCATION

Calculation of annual emissions

Emission Factors

Emission factors for CO emissions for fireplaces ~~were~~ are obtained from AP-42, Table 1.9-1. Units are pounds of pollutant per ton of wood burned.

The emission factors (EFs) for wood stoves ~~were~~ are divided among several stove types. AP-42, Table 1.10-1 gives EFs for six types of wood stove. Of these six, UDAQ staff estimated that three types adequately cover wood stove use in Utah. These three types are Conventional, Non-Catalytic, and Catalytic stoves.

Relative Impact of Each Woodburning System

The PARIA survey ~~was~~ is utilized to apportion wood stoves among the three stove types. PARIA surveyed 1005 households in Davis, Salt Lake, and Utah counties in February 1993 about their home-heating equipment and tendencies.

From the PARIA questionnaire, responses to the question "How old is your woodburning / coal stove?" were used as a surrogate question to estimate ownership of conventional, catalytic, and non-catalytic stoves. PARIA summarized the results of stove age in the appendix of this section. UDAQ made the assumption that all stoves "older than 10 years" are conventional stoves. Catalytic and non-catalytic stoves claim an increasing market share for more current age groupings. The responses are summarized below. These estimates resulted in a split of each heating system type are as follows:

Stove Age	Conventional	Non-Catalytic	Catalytic	All Types
Less than 1 year old	1	1	1	3
1 to 3 years	5	5	2	12
4 to 6 years	18	8	2	28
7 to 10 years	20	7	2	29
older than 10 years	28	0	0	28
Total	72	21	7	100

The "Canon City Element of Colorado SIP for PM_{10} Matter", July 1988, was used to estimate a split of 20:80 for fireplaces and wood stoves. The percentages are based on wood consumed, not heating system ownership. Intuitively, fireplaces comprise more than 20% of the number of systems. However, stove owners tend to burn larger quantities of wood. The stove percentages above ~~were~~ are multiplied by 0.80 to determine the total

percentage of wood consumed by fireplaces and each stove type. The emission factors for each type of burning system ~~were~~ are then weighted by the percentage of wood burned, to arrive at an emission factor for the hybrid burning system (all types).

Type	% Wood Consumed	CO emissions (lb/ton)
Fireplaces	20%	252.6
Conventional Stoves	57%	230.8
Non-Catalytic Stoves	17%	140.8
Catalytic Stoves	6%	104.4
Weighted Factors - Hybrid System	100%	212.28

The wood consumption per capita of 0.1375 tons per person per year is documented in the Utah PM_{10} SIP. Population estimates ~~were~~ are obtained from the Utah Office of Planning and Budget. Unit conversion is applied when needed. The basic equation is:

(population)x(annual wood consumed/person) x (lbs CO emitted/ton of wood) = uncontrolled annual tons of CO.
2.3-3 *EIIP Volume IV*

5.11.2b TEMPORAL RESOLUTION SEASONAL APPORTIONING

Residential wood combustion is strongly dependant on the season temperature. The method which will be used will be the alternative method in EIIP Volume III Chapter 2. This method allocates the emissions using heating-degree days or, at UDAQ discretion, a seasonal activity factor of 0.43 for the three-month winter burning season.

The method for allocating residential wood burning using heating-degree days is as follows:

- Obtain the number of heating degree days for the inventory season and for the entire year.
  - A heating degree day is a measure of the amount of heating necessary for a particular day. One heating degree day is registered for each degree below 65 ^{o}F that the day's average temperature is.
  - This information can be obtained from state climatological offices, airport meteorology stations, or National Oceanographic and Atmospheric Administration (NOAA) climate data.

Seasonal Fuel Consumption (Space Heating)	=	Annual Fuel Consumption For Space Heating	*	Number of Heating Degree Days in Season / Total Heating Degree Days Annually

For example, if the heating degree days for an entire year in an inventory area are 2430, and the heating degree days for the inventory period (119 days) are 1800, then the apportioning factor for the inventory area is:

$$0.74 = \frac{\text{1800 inventory period heating degree days}}{\text{2430 annual heating degree days}}$$

A seasonal activity factor of 0.43 can be used for the three-month winter wood-burning season~~, if other approaches are not possible~~ (EPA, 1991).

Calculation for episode-emission day

Daily Resolution

Residential wood combustion is assumed to occur seven days a week during the heating season.

The Utah Administrative Code, R307-~~1-4.12.3~~ 302 restricted the use of residential woodburning devices during the winter when the local meteorology indicated high, or potentially high, concentrations of airborne particulate. A "green light" means that no woodburning restrictions are in effect, a "yellow light" means that voluntary restrictions are in effect, and a "red light" means that mandatory restrictions are in effect. The public is informed of the burn/no-burn condition during daily weather reports conducted by local television and radio stations and on the front page of the daily newspapers. During the winter of 1992/93, violations were curtailed after friendly warning from UDAQ staff. During the winter of 1993/94, warnings were more firm and citations were given to flagrant violators.

The PM_{10} SIP established a 60% Rule Effectiveness (RE) factor for these PM_{10}-triggered "red" days in Davis, Salt Lake, and Utah Counties. Therefore, emissions released during a “red” episode day will be calculated as 40% (ie., 100% - 60% = 40%) of emissions released on a typical “green” winter day as estimated by SMOKE. In addition, the State recognized that emissions that woodburning emissions will be decreased on "yellow" days due to some voluntary emission reductions. “Yellow” episode days will be calculated as 80% (ie., 100% - 20% = 80%) of emissions released on a typical “green” winter day.

Calculation of projection emissions

Population will be used as the indicator for the growth factor in the projection equation (see Projecting Area Source Emissions under Section 5, Area Source Emissions Data). The meteorological conditions will be assumed to be the same as the February 1996 episode. This includes snow cover, cold temperatures, and fog. Episode day emission concentrations triggered UAC- R307-302 woodburning requirements in February 1996. The same conditions in the future will also trigger this rule. Therefore, the projections will project base year emissions which have been calculated taking credit for this rule.

5.11.3 BAKERIES

Calculation of Annual Emissions

This category covers volatile organic compounds (VOC) emissions from yeast leavening of baked goods at commercial and retail bakeries. Large bakeries are inventoried as point sources. Emissions from bakeries due to fuel combustion are not included in this category. Yeast-leavened bakery products include bread, bread-type rolls, pretzels, and sweet yeast goods such as doughnuts. Ethanol is the primary VOC emitted from the yeast leavening of baked goods. Baked goods that are chemically leavened with baking powder instead of yeast do not produce VOC and are not included in this source category.

There are two basic types of yeast dough mixing processes used in bakeries: sponge-dough and straight-dough. For the purpose of estimating emissions, the length of the fermentation time is the critical difference between these two processes. It is during the fermentation process that the VOC are produced. The sponge dough process, which is most commonly used by commercial bakeries, produces the largest amount of VOC emissions because the required fermentation time can be five hours or more. The straight dough process is primarily used by retail bakeries and has a much lower VOC emissions than the sponge dough process.

Volume III of the EIIP Area Source Category Method Abstract-Bakeries includes an alternative method of estimating bakery emissions using per capita consumption factor. This is the method that will be used for the PM_{10} SIP inventory. The human population estimates ~~were~~ are obtained from the Utah Governor's Office of Planning and Budget. The emission factor of 0.155 tons VOC per 1000 people ~~capita~~ was obtained from a memorandum from the Inventory Guidance and Evaluation Section dated April 24, 1992.

~~Population will be reduced to compensate for bread products produced by the two point source bakeries and sold within counties within the domain.~~

(population) x (0.155 tons VOC/yr / 1,000 people) = VOC tons/yr

To prevent double-counting, bakery emissions produced by point-source bakeries will be subtracted from the total area-based emission estimate since those bakeries supply a portion of the needs of all people living inside

the domain. In other words, emissions from large bakeries are reported as point sources while emissions from medium and small bakeries are reported as area sources; each reported only once.

Calculation of episode and winter day emissions

Episode and winter season day emissions will be calculated by SMOKE using annual emissions.

Calculation of projection emissions

Population will be used as the indicator for the growth factor in the projection equation (see Projecting Area Source Emissions under Section 5, Area Source Emissions Data).

5.11.4 RESIDENTIAL AND COMMERCIAL / INSTITUTIONAL COAL COMBUSTION

Calculation of Annual Emissions

This source category covers air emissions from coal combustion in the residential and commercial sectors for space heating or water heating. This category includes small boilers, furnaces, heaters, and other heating units that are not inventoried as point sources. Residential and commercial coal combustion sectors comprise housing units; wholesale and retail businesses; health institutions; social and educational institutions; and Federal, state, and local government institutions (e.g., military installations, prisons, office buildings).

UDAQ will be using EPA's recommended method as described in Volume III, "Area Source Category Method Abstract- Coal Combustion" dated 4-6-1999 in the EIIP. This method is described below.

The preferred source for coal consumption information is the state energy office which is used by UDAQ. Emission factors are available from *AP-42*, Chapter 1: External Combustion Sources; Section 1.1 for bituminous and subbituminous coals. For residential and commercial sources, the emission factor for hand-fed units will be used.

Estimated area source activity or emissions are adjusted by isolating the quantity of coal consumed by residential and small commercial users. This apportionment is done directly by the Utah Department Of Energy and is reported in their annual publication entitled, "Utah Energy Statistical Abstract" In order to account for the predominant usage of natural gas throughout most Utah counties, the coal demand is heavily weighted toward areas without natural gas availability. A 1-to-50 ratio is applied to account for this availability issue. (This 1-to-50 ratio has been used in all inventories since 1993.)

Calculation for typical winter and episode-emission day

UDAQ will apply the same method used to calculate winter and episode emissions from woodburning including the application of a seasonal adjustment factor of 0.43 for the three-month heating season, 92 season days, and rule effectiveness reductions of 60% for "red light" days and 20% on "yellow light" days. ~~use the preferable method to spatially allocate residential emissions to the county level to allocate fuel use based on the number of households heating with coal and the number of heating degree days.~~

UDAQ reserves the option to refine the seasonal adjustment factor by applying "heating degree day" units instead. A "heating degree day" is a unit of measure used to indicate how cold it has been over a 24-hour period. Daily heating degree days are calculated as the difference between the base value of 65°F and the mean temperature for the day (mean of the high and low temperatures for the day). Annual heating degree days are the sum of the daily heating degree days. Heating degree data is available from the National Oceanographic and Atmospheric Administration (NOAA).

~~The residential spatial apportioning factor is found in Volume III, "Area Source Category Method Abstract - Coal Combustion" of EIIP. Alternative spatial apportioning factors for residential emissions include households that use coal as a primary fuel, population data, or total number of households.~~

~~The commercial/institutional spatial apportioning factor is found in the above document. UDAQ will use the EIIP's recommended "alternative" method to spatially apportion emissions based on population and housing.~~

~~Residential coal combustion is primarily used for space heating purposes. Space heating consumption may be seasonally apportioned using the percentage of annual heating degree days occurring in each month or season. For each episode day in the UDAQ study period, the equation is:~~

$$\text{"Res+Com" Fuel}_{day} = \text{"Res+Com" Fuel}_{annual} * \frac{\text{Heating Degree Days}_{day}}{\text{Heating Degree Days}_{annual}}$$

This coal combustion is assumed to occur seven days a week during the heating season. The Utah Administrative Code, R307-~~1-4.12.3~~ 302 restricted the use of residential coalburning devices during the winter when the local meteorology indicated high, or potentially high, concentrations of airborne particulate. A "green light" means that no coalburning restrictions are in effect, a "yellow light" means that voluntary restrictions are in effect, and a "red light" means that mandatory restrictions are in effect. The public is informed of the burn/no-burn condition during daily weather reports conducted by local television and radio stations and on the front page of the daily newspapers.

The PM_{10} SIP established a 60% Rule Effectiveness (RE) factor for these PM_{10}-triggered "red" days in Davis, Salt Lake, and Utah Counties. Therefore, emissions released during a "red" episode day will be calculated as 40% (ie., 100% - 60% = 40%) of emissions released on a typical "green" winter day as estimated by SMOKE. In addition, the State recognized that coalburning emissions will be decreased on "yellow" days due to some voluntary emission reductions. "Yellow" episode days will be calculated as 80% (ie., 100% - 20% = 80%) of

emissions released on a typical "green" winter day.

Calculation of projection emissions

Population will be used as the indicator for the growth factor in the projection equation (see Projecting Area Source Emissions under Section 5, Area Source Emissions Data). The meteorological conditions will be assumed to be the same as the February 1996 episode. This includes snow cover, cold temperatures, and fog. Episode day emission concentrations triggered UACR- R307-302 woodburning requirements in February 1996. The same conditions in the future will also trigger this rule. Therefore, the projections will project base year emissions which have been calculated taking credit for this rule.

5.11.5 NATURAL GAS

Calculation of Annual Emissions

Statewide natural gas consumption data ~~was~~ is supplied by Questar Corporation allowing UDAQ to utilize EPA's Preferred Method discussed in Volume III *Residential and Commercial/Institution Natural Gas and Liquefied Petroleum Gas (LPG) Combustion* section of the EIIP. The data consisted of county-wide, annual consumption in millions of Btu for general service gas customers (GSDTH) and major gas customers (NONGSDTH). It ~~was~~ is assumed that all industrial natural gas consumption ~~was~~ is included in the point source inventory. The industrial consumption, from the point source inventory, ~~was~~ is subtracted from the NONGSDTH numbers, and the remainder ~~was~~ is assumed to be consumed by commercial/institutional sources.

The first step is to convert the fuel consumption from MMBtu to MMCF. In a letter dated February 2, 2000, Questar Corporation stated that their gas averages 1,055 Btu per cubic foot.

(MMBtu) / (1,055 Btu/CF) = MMCF

Emission factors from Tables 1.4-1 and 1.4-3 of the AP-42 ~~were~~ are used to calculate natural gas combustion emissions for domestic and commercial boilers.

(emission factor, lbs/MMCF) x (fuel consumption) x (1 ton/2000 lb) = emissions in ton/year.

Calculation of Typical Winter-Day and Episode-Emission Day

Episode and winter season day emissions will be calculated by SMOKE using annual emissions.

Calculation of projection emissions

Population will be used as the indicator for the growth factor in the projection equation (see Projecting Area

Source Emissions under Section 5, Area Source Emissions Data).

5.11.6 FUEL OIL COMBUSTION (Previously named Oil Combustion)

Calculation of Annual Emissions

The Utah Energy Statistical Abstract documents the amount of fuel oil consumed by residential sources, commercial sources, and industrial sources in the state of Utah. It ~~was~~ is assumed that the consumption of oil along the Wasatch Front as compared to consumption of fuel oil in the rest of the state ~~was~~ is 1 to 10. First, a consumption factor ~~was~~ is calculated using the 1 to 10 ratio described above. Population estimates ~~were~~ are obtained from the Utah Office of Planning and Budget. The amount of fuel oil consumed ~~was~~ is then determined by multiplying the consumption factor by the population of the given county or city. The fuel oil consumed by industrial sources and accounted for in the point source inventory ~~was~~ is subtracted from the industrial fuel oil consumption for industrial area sources.

For example:

OCW = Oil consumed/person in the 4 Wasatch Front Counties
OCNW = Oil consumed/person in the rest of the state
OC = total oil consumed/year in Utah
WP = Wasatch Front population
NWP = Population in the rest of the state

$$(OCW \times WP) + (OCNW \times NWP) = OC$$

and

$$(10) \times (OCW) = OCNW$$

Therefore:

$$OCW = OC / (WP+(10 \times NWP))$$

The fuel oil consumed in each non-attainment area is calculated as follows:

Oil consumed in Davis County = OCW x (population of Davis County).

Using these numbers and the emission factors in AP-42, in table 1.3-2, the emissions ~~were~~ are calculated.

(EF, lbs/ton) x (OC tons/yr) x (1 ton/2,000 lb) = emissions in ton/year.

EF = Emission Factor

OC = Fuel Consumption

Calculation of typical winter and episode-day emissions

Since natural gas consumption records (available through Questar Gas Company) are more detailed than fuel oil records, consumption of both are generally linear, and both are loosely linked to seasonal ambient air temperatures, UDAQ assumes that seasonal fuel oil use tracks with seasonal natural gas use. ~~It was assumed that the percent of fuel oil combustion in the ozone season was identical to that of natural gas use, which has been provided by Questar Corporation.~~ Further, there ~~There were~~ are 119 days in the winter season.

(VOC tons/yr) x (%NG use in winter) / (119 days/winter season) = VOC tons/day.

Calculation of projection emissions

Population will be used as the indicator for the growth factor in the projection equation (see Projecting Area Source Emissions under Section 5, Area Source Emissions Data).

5.11.7 BREWERIES, WINERIES, DISTILLERIES

Telephone survey with the state's two largest breweries led to very low emissions estimate. The facilities are considered to be micro breweries. The emissions are negligible based on the amount of beer produced in these facilities. This category is not included in EIIP.

5.11.8 CATASTROPHIC/ACCIDENTAL RELEASES

There were no catastrophic/accidental releases in the PM_{10} domain during 1996. Therefore, emissions during the PM_{10} season are estimated at zero.

5.11.9 SYNTHETIC ORGANIC CHEMICAL STORAGE TANKS (SOCST)

No data has been found that this type of material is stored in Utah. Therefore, the emissions are zero for this category.

5.12 SOLID WASTE INCINERATION AND OPEN BURNING

5.12.1 INCINERATION

Volume III, Area Sources Preferred and Alternative Methods of EIIP does not include incineration. New Source Performance Standards have been developed for incineration sources, and therefore, they are included as point sources. UDAQ will not include this category in the 1996 PM_{10} episode inventory under air source listings.

5.12.2 FOREST FIRES

Calculation of annual emissions

Forest fire data ~~was~~ is collected by the Utah Division of State Lands and Forestry. They compile data for total acres burned on public and private lands (by county) excepting private house and field fires inside metro area. Emission factors for forest and range fires for the Intermountain Region, Region 4, ~~were~~ are obtained from AP-42. These factors are based on an average fuel loading of 40 Mg/hectare in this region.

First, the emission factors are converted to English units.

$$(\text{EF, kg/hectare}) \times (1.1023 \times 10^{-3} \text{ tons/kg}) / (2.471 \text{ acres/hectare}) = \text{EF tons/acre.}$$

Then the emission factors are multiplied by the number of acres burned to obtain the annual emissions for each county.

$$(\text{EF, tons/acre}) \times (\text{acres burned/yr}) = \text{emissions tons/yr.}$$

Calculation of typical winter and episode-day emissions

Forest fires occur primarily during the summer months. The fire season typically lasts 184 days/year according to USFS, Intermountain Regional office staff. (Same length accepted in past years.) After reviewing information supplied by Utah Division of State Lands and Forestry, the accepted clearing house for forest and range burning, it was determined that there were no forest fires in the domain during 1996 winter season; and therefore, no fires occurred during the episode period.

Calculation of projection emissions

Since the projections will be based on a winter day which is not included in the fire season and since typically there is snow cover, emissions from this category will be assumed to be zero.

5.12.3 FIREFIGHTING TRAINING

Telephone surveys in 1991, and repeated in year 2000, confirm that fire training activities occur primarily in simulators with theatrical smoke. Actual fire training events are random and rare. UDAQ assumes that emissions

are negligible.

5.12.4 STRUCTURE FIRES

Calculation of annual emissions

Structural fires are estimated by Alternative Method 2 outlined in Volume III, Chapter 18 of EIIP. This method calculates the emissions by multiplying human population (by county) by national-default emission factors. In the absence of local trends, national average conditions will be projected onto our domain: Six fires per 1000 residents and 1.15 tons of material burned per average fire. Emission factors for VOC, NO_x, and PM are included in this EPA guidance document. These factors are multiplied by the population of each city or county to obtain the annual emissions of VOC, NO_x and PM_{10}. Population numbers ~~were~~ are obtained from the Utah Governor's Office of Planning and Budget.

(population)(6 fires/1000 people)(1.15 tons material/fire)(EF, lbs/ton material) = emissions tons/yr.

Calculation of episode and winter emissions

Episode and winter season day emissions will be calculated by SMOKE using annual emissions.

Calculation of projection emissions

Population will be used as the indicator for the growth factor in the projection equation (see Projecting Area Source Emissions under Section 5, Area Source Emissions Data).

5.12.5 PRESCRIBED BURNING/SLASH BURNING/AGRICULTURAL BURNING

Calculation of annual emissions

Annual emissions for both slash and prescribed burning are estimated as zero. Calculations for agricultural burning is described below. Any slash or prescribed burning by the Forest Service is accounted for in the Forest Fire section of this inventory.

Annual emissions for agricultural burning are very difficult to estimate. Richard Harvey, Director of Davis County Environmental Health & Laboratory Division, estimated that 1/3 of the planted acres in this area are burned. The number of harvested acres, per county, ~~was~~ is obtained from the Utah Department of Agriculture. A fuel loading factor of 2 tons per acre ~~was~~ is obtained from AP-42, Section 2.5 Open Burning, Table 2.5-5.

(harvested acres) x (1/3) x (2 tons/acre) = tons of material burned.

Emission factors from AP-42, Table 2.5-5 for PM, and VOC will be used. These emission factors will be multiplied by the tons of material burned to obtain annual emissions.

(tons of material burned) x (EF lbs/ton) x (1 ton/2000 lbs) = emissions tons/yr.

A population comparison was done in the 1990 base year inventory to see if the calculated emissions seemed feasible.

Calculation of typical winter day, episode-emission day, and projection emissions

Due to cold and snowcovered conditions, it is reasonable to assume that agricultural burning will not occur during episode days, therefore no emissions will be calculated or projected for this category. ~~Emissions released during typical winter and episode days will be calculated SMOKE software.~~

5.12.6 OPEN BURNING

According to State of Utah, Utah Air Conservation Rules, R307-202-5(3)(e)(I), open burning is not allowed without a permit. Permits are only issued during a 30-day period between March 30 and May 30, thereby prohibiting emissions during the winter months. Therefore, open burning emissions are not included in the PM_{10} SIP inventory.

Previously detonation was included in this category. EIIP does not include it as an area source. Companies that do detonation are included in the point source inventory.

5.12.7 AIRCRAFT/ROCKET ENGINE FIRING AND TESTING

Calculation of annual emissions

1. Rocket testing

No rocket testing occurs within the domain that has not otherwise been accounted for under the point source inventory.

2. Aircraft testing, tuning, and repair

A UDAQ 1991 telephone survey of eight airplane maintenance agencies indicated that maintenance procedures emit approximately 0.7% to 1% of the emissions of landing/take off (LTO) events. For this reason, UDAQ added

1% to LTO emissions to ~~In other words, we estimated emissions from LTO and estimated an additional 1% to~~ account for airplane fleet maintenance.

Calculation of typical winter and episode-day emissions

Daily emissions for airport LTOs are calculated in the non-road portion of this inventory. The same 1% factor is applied to the daily emissions from LTOs to determine the daily emissions from aircraft maintenance.

(LTO emissions in tons/day) x (1%) = aircraft maintenance emissions tons/day.

Calculation of projection emissions

The growth factor in the projection equation (see Projecting Area Source Emissions under Section 5, Area Source Emissions Data) will use population as the indicator.

5.12.8 CHARCOAL GRILLING

In 1993, this category was believed to be negligible, prompting EPA Region VIII to issue their 8/19/1993 letter saying that "...charcoal grilling emissions do not have to be addressed by the State at this time." Therefore, they were not calculated in 1996.

5.12.9 VEHICLE FIRES

Calculation of annual emissions

This category covers air emissions from accidental vehicle fires. Vehicles included are any commercial or private mode of transportation that is authorized for use on public roads.

The number of vehicle fires will be requested from state and local fire marshals and the public safety departments. If the information is not available for 1996, the national estimate of vehicle fires from *Fire in the United States* (FEMA, 1997) (available from the Federal Emergency Management Agency *http://www.usfa.fema.gov/nfp/data/fius9th.htm*) will be used. The national total of transportation fires reported in the FEMA report must be corrected by subtracting the number of non-roadway fires reported such as rail, water, and air transportation fires. In 1994 the respective percentages of fires reported for these non-roadway transportation modes were 0.2, 0.5, and 0.1 (i.e., 99.2% of the fires were highway vehicle fires). National highway vehicle fires in 1994 are estimated to be 402,000 fires. The national estimate will be apportioned to the local level using state vehicle miles traveled (VMT).

Emission factors are taken from AP42, Section 2.5, Open Burning. These factors cover automobile components including upholstery, belts, hoses, and tires. The amount of vehicle material burned (the fuel loading) in a vehicle fire must be estimated to use these factors. A conservative assumption is that an average vehicle has 500 pounds of components that can burn in a fire, based on a 3,700 pound average vehicle weight (CARB, 1995).

The emission factors (EPA 1996) are as follows:

Pollutant	**Lbs/ton burned**
PM	100
CO	125
Methane	10
Nonmethane TOC	32
NO_x	4

~~**Calculation of typical winter-day emissions**~~

~~The emissions from this category will be spatially apportioned using one of the following methods. Vehicle miles traveled may be used to spatially apportion national fire activity to the state level. The Federal Highway Administration provides state level vehicle miles traveled (*http://www.fhwa.dot.gov/ohim/ohimstat.htm*). To apportion to the local level, local vehicle miles traveled may be obtained from the state department of transportation. Alternately, state level data may be apportioned to local areas based on vehicle registration information obtained from the state department of motor vehicles. Other surrogates such as population or roadway miles may be used to apportion the number of fires to the local level.~~

Calculation for episode-emission day

The emissions are calculated from ~~actual fires that occurred~~ theoretical fires that are presumed to occur during ~~each~~ any episode day ~~based on reported by all municipal fire departments within the domain~~ based on human populations and national vehicle fire default values.

Calculation of projection emissions

The growth factor in the projection equation (see Projecting Area Source Emissions under Section 5, Area Source Emissions Data) will use population as the indicator.

5.13 BARGE, TANK, TANK TRUCK, RAIL CAR AND DRUM CLEANING

5.13.1 BARGE CLEANING

No barges are used to transport materials on any of Utah's small rivers or the Great Salt Lake. The estimated VOC emissions from this process is zero.

5.13.2 CHEMICAL TANK EMISSIONS

Various tank emissions are included as portions of all three inventory headings: the Point, Area, and Mobile source headings. Because these emissions are already accounted for in the rest of the inventory, this section is a negative declaration. In review, the following storage tanks are covered under the following inventory sections:

Point Source Inventory

VOC losses from on-site petroleum tanks at all fuel refineries within the NAA.

VOC losses from on-site containers of fuels, solvents, and coatings used or consumed by point sources covering the industries listed in the point source inventory report.

Area Source Inventory

VOC losses from the distribution of fuel to gas stations within the domain. Area source accountability includes fuel loading at bulk terminals, tank trucks in transit, tank trucks during unloading at gas stations, service station breathing losses, and refueling of private vehicles. Estimates are based on gallons of fuel distributed.

VOC losses from the storage of solvents used for parts degreasing.

VOC losses from the use of solvents assisting the printing and graphics industries.

VOC losses from the storage of cutback and emulsifiers for asphalt production and application.

VOC losses from tanks at drycleaning operations.

VOC losses from the storage of miscellaneous commercial/consumer solvents.

The area source inventory emissions are accounted for under other categories.

Calculation for winter and episode-emission day

The emissions are considered to be negligible or zero for this category because they are accounted for under separate categories.

5.13.3 EMISSIONS FROM TANK TRUCK CLEANING

Calculation of annual emissions

Emissions of 0.11 tons per year (tpy) for Salt Lake County, and 0.03 tpy for Davis County were calculated for this category in the 1990 inventory. Because the emissions were low, the calculations have not been repeated, and emissions from this category are presumed to continue to remain low both annually and season days.

Due to these low emissions ~~and population~~, no additional calculations will be made for ~~preformed for other areas in~~ the domain.

Calculation for winter and episode-emission day

The emissions are ~~considered to be~~ negligible ~~the same as an average winter day except for the Sunday episode day. Emissions are considered to be zero on Sunday because of the operation schedule of this type of process.~~

Calculation of projection emissions

This category will not be included in the projection calculations.

5.13.4 RAILCAR CLEANING

Calculation of annual emissions

Based on the research completed for this category, it is the State's conjecture that railcar cleaning companies in the domain are nominal or nonexistent and, therefore, any emissions from this type of cleaning process are reported to be zero.

5.13.5 DRUM CLEANING

Calculation of annual winter and episode-day emissions

Total 1990 emissions of 86 pounds per year of NO_x and zero emissions of VOC were released into the airshed for this category. Because the emissions ~~were~~ are so low, the calculations have not been repeated for 1996, and emissions from this category are assumed to be negligible for annual emissions and typical winter day emissions.

6. MOBILE SOURCES

6.1 NON-ROAD MOBILE

6.1.1 AIRCRAFT

Calculation of Annual Emissions

The airports in Utah are divided into two categories, large airports which require a more detailed inventory, and general aviation airports which require a less detailed inventory. There are two large airports in Utah, the Salt Lake City International Airport (SLCIA), and Hill Air Force Base. The rest of the airports do not have a large number of flights per year, and are considered general aviation airports.

1. Large Airports

a. Salt Lake City International Airport

Aircraft at the Salt Lake City International Airport (SLCIA) are divided into five categories for the purpose of this inventory: (1) commercial carriers that are listed in the FAA Aircraft Engine Emissions Database (FAEED), (2) military aircraft that are listed in the FAEED, (3) other commercial carriers or military aircraft, (4) general aviation aircraft, and (5) air taxi aircraft.

I. Civilian Aircraft that are listed in the FAEED

The FAEED calculates emissions from aircraft based on the number of landing and takeoff cycles (LTO) that occur at the airport in a year. The annual number of departures for each type of commercial carrier, which corresponds to the number of LTO, ~~was~~ is obtained from The Airport Activity Statistics of Certificated Route Air Carriers. If an aircraft type ~~was~~ is not included in the database, a similar aircraft ~~was~~ is used as a surrogate. The World Encyclopedia of Civil Aircraft and Jane's All the World's Aircraft ~~were~~ are used to identify similar aircraft. If a similar aircraft ~~was~~ is not identified, the emissions ~~were~~ are calculated as described in section iii below. The average taxi in/taxi out time for Delta Airlines ~~was~~ is used for all aircraft at the SLCIA.

The type of aircraft, the probable engine on each aircraft, and number of LTO for that engine type, and details about the taxi and idle times ~~were~~ are entered into the database. Tim Gwynette, the Environmental Programs Coordinator at SLCIA, provided a cross-referencing index to associate aircraft names and their common abbreviations. The software then calculated emissions of PM_{10}, VOC, SO_x and NO_x for each type of aircraft.

ii. Military Aircraft that are listed in the FAEED

The total number of military aircraft operations at the SLCIA ~~were~~ are obtained from the Steve Domino and/or his representative at CM2MHill. LTO cycles are determined by dividing the number of operations

by two. Three types of military aircraft typically use the airport: Lockheed C-130, Boeing C-135B, and Lac Georgia C141B, however, the number of LTOs for each type of plane is not available. Each of the aircraft emissions ~~were~~ are calculated using the FAEED assuming the entire LTO number for military aircraft applied to that aircraft. The total emissions ~~were~~ are then divided by three to obtain the emissions from this category of aircraft.

iii. Other Commercial Carriers or Military Aircraft

Several types of aircraft that operate at the SLCIA are not included in the FAEED, and a similar aircraft could not be identified. The emissions from these aircraft ~~were~~ are calculated separately, using the method outlined in "Procedures for Emission Inventory Preparation Volume IV: Mobile Sources," EPA-450/4-81-026d.

Information about the engine used on the aircraft ~~was~~ is obtained from tables within Volume IV, including fuel flow, average time, and emission factors in four modes of operation: takeoff, climb out, approach, and taxi/idle. Aircraft manufacturers ~~were~~ are contacted, as needed, to obtain additional information about the engines used in a particular aircraft. The taxi/idle default times ~~were~~ are replaced by average taxi in/taxi out times for Delta Airlines at the SLCIA. The emissions for a particular pollutant in each mode ~~were~~ are calculated using the following equation.

All PM_{10} pollutants (tons/yr) = time (minutes) * fuel flow (lbs/min)/1000 * (lb pollutant/1000 lb fuel) x (# of engines/plane) * (# of LTO cycles/yr) * (1 ton/2000 lbs)

The emissions during all four modes ~~were~~ are then added to obtain the total emissions, in tons/yr, for that type of engine.

iv. General Aviation Aircraft and Air Taxis

Smaller aircraft, without detailed information are categorized by the Wasatch Front Regional Council as general aviation aircraft and air taxis. Emissions from these aircraft are calculated using general aviation and air taxi emission factors from "Procedures for Emission Inventory Preparation Volume IV: Mobile Sources," EPA-450/4-81-026d.

PM_{10} pollutants (tons/yr) = (# of LTO cycles) * (lb pollutant/LTO cycle) * (1 ton/2000 lbs)

b. Hill Air Force Base

Aircraft at Hill Air Force Base (HAFB) are divided into four categories for the purpose of this inventory: (1) military aircraft that are listed in the FAEED, (2) military aircraft listed in EPA guidance, (3) other military aircraft, and (4) touch and go activities. Actual 1994 flight statistics ~~were~~ are received from Hill AFB and utilized in these calculations.

I. Military Aircraft that are listed in the FAEED

The FAEED calculates emissions from specific types of aircraft based on the number of landing and takeoff cycles (LTOs) that occur at the airport in a year. The annual number of landing and takeoff cycles (LTOs) for each type of aircraft ~~was~~ is obtained from Hill Air Force Base. If the type of aircraft ~~was~~ is not included in the database, a similar aircraft ~~was~~ is used as a surrogate. The World Encyclopedia of Civil Aircraft and Jane's All the World's Aircraft ~~were~~ are used to identify similar aircraft. If a similar aircraft ~~was~~ is not identified, the emissions ~~were~~ are calculated as described in section ii below.

The type of aircraft and number of LTOs ~~were~~ are entered into the database. The database then calculated emissions of VOC, CO, and NO_x from each type of aircraft, and totaled the emissions for the category.

ii. Military Aircraft listed in EPA guidance

Several aircraft that operate at Hill Air Force Base are not included in the FAEED, and a similar aircraft could not be identified. The emissions from these aircraft ~~were~~ are calculated separately, using the method outlined in "Procedures for Emission Inventory Preparation Volume IV: Mobile Sources," EPA-450/4-81-026d.

Information about the engine used on each type of aircraft ~~was~~ is obtained from tables within Volume IV, including fuel flow, average time, and emission factors in four modes of operation: takeoff, climb out, approach, and taxi/idle. The emissions for a particular pollutant in each mode ~~were~~ are calculated using the following equation.

PM_{10} pollutant (tons/yr) = time (minutes) * fuel flow (lbs/min)/1000 * (lb pollutant/1000 lb fuel) * (# of engines/plane) * (# of LTO cycles/yr) * (1 ton/2000 lbs)

The emissions during all four modes ~~were~~ are then added to obtain the total emissions, in tons/yr, for that type of engine.

iii. Other Military Aircraft

There ~~were~~ are several types of aircraft that ~~were~~ are not addressed in the FAEED or in EPA guidance. In these cases, the emissions calculated by Hill Air Force Base in their annual emissions inventory ~~were~~ are used.

iv. Touch and Go Activities

Touch and go operations at Hill Air Force Base could not be calculated using the FAEED model or by using the Volume IV guidance. For these operations, the emissions calculated by Hill Air Force Base in

their annual emissions inventory ~~were~~ are assumed to be accurate. This approach was approved by Tim Russ, EPA Region VIII, in a letter dated June 2, 1993.

2. General Aviation Airports

Most of the airports in Utah are small, local airports. Detailed information about the types of planes, and the number of flights for different planes is not available. Because detailed information is not available, the fleet average procedures outlined in "Procedures for Emission Inventory Preparation Volume IV: Mobile Sources," EPA-450/4-81-026d ~~were~~ are used to calculate emissions. The number of operations at each airport per year ~~was~~ is supplied by the Wasatch Front Regional Council. The number of landing and takeoff cycles (LTOs) ~~was~~ is calculated by dividing the number of operations by two. Emissions from these flights ~~were~~ are calculated using the general aviation emission factors from Volume IV.

$$PM_{10} \text{ pollutants (tons/yr)} = (\#\text{ of LTO cycles}) * (\text{lb pollutant/LTO cycle}) * (1 \text{ ton}/2000 \text{ lbs})$$

Calculation of typical winter-day and episode-day emissions

~~Operational data were obtained from either the Wasatch Front Regional Council, or the specific airport to determine the activity level during the winter season. For small airports where data are not readily available, it was assumed that 15% of annual activity occurred during the winter season because local airports would be used more heavily during summer than the winter. Seasonal emissions were calculated by multiplying the annual emissions by the percent of activity during the winter season. Because there are 119 days in the winter season, the seasonal emissions were divided by 119 to obtain typical CO winter day emissions.~~

~~PM_{10} tons/day = (PM_{10} tons/yr) * (% activity during winter PM_{10} season) / 119~~

Episode and winter season day emissions will be calculated by SMOKE using annual emissions.

Calculation of projection emissions

The growth factor in the projection equation (see Projecting Area Source Emissions under Section 5, Area Source Emissions Data) will use population as the indicator.

6.1.2 RAILROAD LOCOMOTIVES

The actual railroad diesel consumption by county is multiplied by national-default emission factors to calculate these emissions. Each rail company reported their own activity and diesel use. Emissions are not included in counties that do not have rail lines. No seasonal differences are noted.

Calculation of Annual Emissions

1. Line Haul Emissions

Three railroad companies ~~were~~ are operating in the domain area during 1996; Southern Pacific Lines, Utah Railways Company, and Union Pacific Railroad. Each company consumed diesel fuel to drive their locomotives. All three reported their diesel consumption by county.

Emission factors ~~were~~ are obtained from "Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources," EPA-450/4-81-026d, July 1989, page 204, table 6-1.

(diesel consumption, gal/year) x (EF, lb/gal) / (2000 lb/ton) = emissions, tons/yr.

2. Yard Emissions:

These railroad companies provided information about the number of yard engines that ~~were~~ are operating in the area. The number of engines ~~was~~ is averaged between days of the week and different shifts to provide an average number of yard engines. Emission factors ~~were~~ are obtained from Volume IV, pages 206-207, table 6-2.

(Number of yard engines) x (EF, lbs/engine/yr) / (2000 lb/ton) = emissions, tons/yr.

Calculation of typical winter day and episode-emission day

Emissions released during typical winter and episode days will be calculated by SMOKE software.

Calculation of projection emissions

Changes in transportation employment, as projected by the Utah Office Of Planning And Budget, will provide the growth factor in the projection equation (see Projecting Area Source Emissions under Section 5, Area Source Emissions Data).

6.2.3 MISCELLANEOUS NON-ROAD EQUIPMENT

Calculation of Annual Emissions

EPA headquarters has recently released a software model, entitled NONROAD, to calculate emissions from ~~about 80~~ all categories of non-road equipment designed for construction, manufacturing, lawn and garden maintenance, and recreational uses. UDAQ will utilize this software, following the EPA's guidance for its use and application.

Trial calculations from this NONROAD software show reasonably accurate results using the software's internal default parameters with one glaring exception : the category entitled "Recreational Equipment" gives pollution levels that are far too high for a February episode day in the domain. A careful review of the NONROAD

Users' Guide acknowledges this weakness.

The model also calculates emissions for another similar category entitled "Pleasure Craft". During a February episode day, the only equipment in Utah that appears to fit this description are snowmobiles. Using educated guessing, UDAQ staff estimated snowmobile emissions for the entire UAM-AERO domain, discovering the result to be very similar to the NONROAD's emission estimate for all "Pleasure Craft" in the domain.

For these reasons, UDAQ will delete the "Recreational Equipment" category altogether and retain the "Pleasure Craft" category exactly as given, accepting the latter category to be entirely snowmobile usage during an episode day.

Calculation of ~~typical winter day and~~ episode-emission day

The NONROAD software will directly calculate emissions during a typical episode weekday and typical episode weekend day. It appears that no additional refinements can be made for specific episode days. ~~also be used for typical winter day and episode day estimates if one is offered by the software. If not offered, emissions will be calculated with the SMOKE software.~~

7. POINT SOURCE EMISSION DATA

The 1996 statewide annual emissions inventory for point sources will be used to derive the modeling domain inventory. The point source data ~~was~~ is extracted by county and then filtered by UTM data to determine which inventoried sources are within the modeling domain. These sources include the major and Title V sources, sources with 10 tons/year of VOC in Salt Lake and Davis Counties, sources with 25 tons/year of NO_x in Utah, Salt Lake, and Davis Counties, and sources with 25 tons/year of SO_x and PM_{10} in Salt Lake and Utah Counties. For the episode day inventory modeling, DAQ will utilize all the available data on the sources in the domain. This will help to make the modeling process as accurate and reliable as possible. **However, the use of this data in the episode day inventory will not necessitate the specific identification of those sources in the Maintenance Plan, nor will they constitute a "SIP emission limit" nor "SIP Source" nor "SIP cap" in the historic use of the terms.**

Average daily emissions of SO_x, NO_x, PM_{10} and VOC during the first quarter of the year will be calculated using available quarterly production data and days/week operating data. These average daily emissions will be used along with hours of operation and start and finish times in the model.

Sources with actual emissions of 250 tons/ year (or greater) of PM_{10}, NO_x, or SO_x will be surveyed to determine if any anomalies occurred in their processes during the episode days. This data will be incorporated into the episode modeling.

The inventory submittals of the sources listed in the following table will be quality checked. By checking these submittals in detail, over 90 percent of the actual emissions of NO_x, SO_x and PM_{10} from major sources will be

checked. **However, the quality checking of the data from these sources will not necessitate the specific identification of those sources in the Maintenance Plan, nor will they constitute a "SIP emission limit" nor "SIP Source" nor "SIP cap" in the historic use of the terms.**

COMPANY	SITE	PM_{10}	NO_x	SO_x
Alliant Techsystems Incorporated	Bacchus Works: Plant 1/NIROP/Graphite Structures	123.47	50.82	0.26
Amoco Petroleum Products	Salt Lake City Refinery	43.95	514.32	982.63
Central Valley Water Reclamation Fac.	Wastewater Treatment Plant		136.65	1.58
Chevron Products Co - SL Refinery	Salt Lake Refinery	38.00	621.20	1115.60
Companion Systems Incorporated	Fiberglass Manufacturing			
Davis County Solid Waste Management	Energy Recovery Facility (DCERF)	5.05	341.85	75.46
DAW Technologies Incorporated	Ultraclean Manufacturing Site	1.50	12.56	0.07
Defense Logistics Agency	Defense Distribution Depot, Ogden (DDOU)	43.67	119.89	34.25
Flying J Incorporated	Flying J Refinery (Big West Oil Co.)	40.57	282.55	573.87
Geneva Rock Products	Point of the Mountain Facility	68.69	136.50	31.48
Geneva Steel	Steel Manufacturing Facility	1128.19	1941.23	2019.50
Hill Air Force Base	Main Base	169.98	161.63	16.07
Holnam Incorporated	Devil's Slide Plant	601.09	583.95	3.45
IMC Kalium Ogden Corporation	West Desert Operation - Salt & Potash Plants	174.20	116.10	8.22
Inland Refining Incorporated	Petroleum Products Refining	3.38	35.22	37.46
Interstate Brick Company	Brick Manufacturing Plant	170.58	36.36	112.91
Kennecott Barneys Canyon Mining Company	Barney's Canyon Mine	159.20	302.68	5.05
Kennecott Utah Copper Corporation	Smelter, Refinery	403.75	169.89	1555.24
Kennecott Utah Copper Corporation	Mine & Copperton Concentrator	2319.05	2598.39	35.20
Kennecott Utah Copper Corporation	N Concentrator, Power Plt, Lab, Tailings Impoundmnt	225.86	2156.15	2141.42
Magnesium Corporation of America	Rowley Plant	1313.13	780.54	40.89
Pacific States Cast Iron Pipe Company	Pipe Casting Plant	12.30	33.11	3.08
PacifiCorp	Little Mountain Power Plant	37.10	399.12	0.50
Phillips 66 Company	Phillips Refinery	63.43	520.26	864.05
Salt Lake City Airport Authority	Salt Lake City International Airport	18.68	221.61	18.15
Union Pacific Resources Company	Yellow Creek Gas Plant		181.40	
Thiokol Corporation	Promontory Plant	317.93	85.29	20.20
University of Utah	University of Utah facilities	4.70	189.70	6.20
Utelite Corporation	Shale Processing	28.59	146.45	63.25
Vulcraft, Division of Nucor Corporation	Steel Products Manufacturing	18.49	11.72	0.37
	TOTALS	7534.53	12887.14	9766.40

POLLUTANT	EMISSIONS FROM MAJOR SOURCES	EMISSIONS FROM QUALITY CHECKED SOURCES	PERCENTAGE

PM_{10}	4558.91	7534.53	165 %
NO_x	8335.3	12887.14	154 %
SO_x	8664.86	9766.40	113 %

The percentages are over 100 percent because most major sources for one pollutant are minor for the others.

During the checking of the sources listed in the above table, any calculations that are based on emission factors in sections of EPA's Compilation of Air Pollutant Emission Factors, AP-42 that have been updated shall be recalculated using the most current emission factors. Due to the large amount of resources required and small impact on the modeling outcome, emission calculations for the remaining point sources that use AP-42 factors shall NOT be updated.

In addition, the sand and gravel sources with operations at the "point of the mountain" and "Beck Street" will be quality check for accuracy. However, the quality checking of the data from these sources will not necessitate the specific identification of those sources in the Maintenance Plan, nor will they constitute a "SIP emission limit" nor "SIP Source" nor "SIP cap" in the historic use of the terms.

Emission points (units) within point sources in the domain that significantly impact the modeling analysis will be identified. (THIS HAS NOT YET BEEN DONE) The selection will be made by identifying all emission points that (i.e. emit a certain level of annual emissions; emit $\geq$ 100 tons/winter weekday of PM_{10} or $\geq$ 250 tons/winter weekday of So_x, NO_x, or VOC or some other level; sources in the hot spot analysis; etc.) This selection will be made using actual emission figures. These emission points *may* be regulated as specifically identified emission points in the SIP similar to the regulations outlined in the current SIP (i.e., everything that goes into the calculations documented in detail and requiring SIP changes when modified). This selection criteria is being made based on the current understanding of the way the model distributes the emissions throughout the gridded area, how the model is meant to be used, and how the data may be used in the future. ~~These units will be quality checked in detail.~~

The emission points (units) at the point sources that are not specifically identified as significantly impacting the modeling analysis and all other point source data available from the annual 1996 inventory will be included in the data set for the episode modeling process. **Using this information in the episode modeling process will NOT necessitate the specific identification of those sources in the Maintenance Plan, nor will they constitute a "SIP emission limit" nor "SIP Source" nor "SIP Cap" in the historic use of the terms. The analysis of this data that was done for the annual inventory NOT included in the above table will NOT be upgraded. It will be assumed that the data is accurate.**

~~The projection year inventory protocol will be developed in the near future. It will include the following points.~~

Projection year inventory

~~A.~~ The sources that contain emission points that significantly impact the modeling analysis will be contacted and asked to identify any production/emission changes between now and 2003 and between 2003 and 2020 or 2030 that would override the growth projections calculated according to the EIIP Volume X for point sources. The growth projections will be calculated for the entire source. However, calculating projections based on the entire source will not necessitate the specific identification of those entire sources in the Maintenance Plan, nor will they constitute a "SIP emission limit" nor "SIP Source" nor "SIP cap" in the historic use of the terms.

~~B.~~ Allowable SO_x, NO_x, and PM_{10} emissions will be researched for point sources which had actual emissions in 1996 of 100 tons/year of SO_x or NO_x, or 70 tons/year or more of PM_{10}. (These are the cutoffs presented in the draft Consolidated Inventory Rule.) If any of these sources have allowable emissions of 250 tons/year or more of SO_x and/or NO_x, or allowable emissions of 100 tons/year or more of PM_{10}, allowable emissions will be included in the projection inventory process. ~~Any emission points (units) whose allowables are deemed to have the potential to have significant impact on the attainment status in the projection years will be included in the projection inventory.~~ These sources will be contacted to find out if production/emission changes are planned between now and 2003 and between 2003 and 2020 or 2030 that would increase the sources actual emissions, and if so, when those actuals would exceed the present allowables. Based on this information, a determination on how the emissions will be grown for the projections will be made and explained in the Technical Support Document of the PM_{10} SIP. ~~in the future would override the growth projections calculated according to the EIIP Volume X for point sources. Based on this information, growth projections will be calculated for the entire source.~~ The use of this data in the model will not necessitate the specific identification of those sources in the Maintenance Plan, nor will they constitute a "SIP emission limit" nor "SIP Source" nor "SIP cap" in the historic use of the terms.

~~C.~~ Major point sources that do not have units that are identified as units that may be regulated will be included in the projection inventory. Their growth will be based on the calculations outline in the EIIP Volume X for point sources. However, the use of this data in the projection inventory will not necessitate the specific identification of these sources in the Maintenance Plan, nor will they constitute a "SIP emission limit" nor "SIP source" nor "SIP Cap" in the historic use of the terms.

~~D.~~ Non-major point sources and area source emissions will be projected according to EIIP Volume X area source calculations. The use of these calculations in the model will not necessitate the specific identification of those sources in the Maintenance Plan, nor will they constitute a "SIP emission limit" nor "SIP Source" nor "SIP Cap" in the historic use of the terms.

Several point sources have reduced emissions since the current PM_{10} SIP was put into place. When these reductions were made, the sources created banked emissions which can be used for future expansion. Any banked emissions in the domain will be included in the projection process.

If the model does not show continuing compliance with the NAAQS, further analysis on what controls to initiate in the domain, how to deal with the allowable vs actual buffers, and how to manage banked emissions will be done.

8.1 BIOGENIC EMISSIONS

The emissions from biogenics is calculated by multiplying land area and foliage types by county by PC-BEIS software emission factors. The Geographic Information System (GIS) is used to create a land use data base with a higher degree of spatial resolution than the GEOECOLOGY data base. Since biogenic emissions are at a minimum during PM episodes, they will not be included in the episode or projection inventories.

9 SOIL EMISSIONS

9.1 SOIL DECAY NO_x

NO_x emissions from soil are believed to be negligible during winter episodes in which the temperatures are low. The NO_x from soils will not be included in the modeling process.

9.2 UNPAVED FARM ROAD DUST (from vehicle travel)

Calculation of Annual Emissions

The Utah Department Of Agriculture publishes annual acreage of harvested cropland by county. This information, combined with some basic assumptions about the frequency and nature of farm road gridding, will be combined with AP42 emission factors (for PM only) to estimate fugitive dust emissions within the domain area.

~~**Calculation of episode-emission day**~~

~~Episode and winter season season day emissions will be calculated by SMOKE using annual emissions.~~

Calculation of episode-emission day and projection emissions

Since unpaved farm travel is very low in winter and these roads are snowcovered during the episode, UDAQ has determined that emissions from this category are zero or virtually zero. For this reason, no calculations are made.

9.3 UNPAVED NON-FARM ROAD DUST

Calculation of Annual Emissions

Roads, paved or unpaved, grid virtually all lands within the domain area. Total domain land area within the domain, combined with some basic assumptions that apply to the California's Central Valley, will be combined with AP42 emission factors (for PM only) to estimate fugitive dust emissions on unpaved non-farm roads within our study area.

~~**Calculation of episode-emission day**~~

~~Episode and winter season day emissions will be calculated by SMOKE using annual emissions.~~

Calculation of episode-emission day and projection emissions

Since unpaved non-farm travel is very low in winter and these roads are snowcovered during the episode, UDAQ has determined that emissions from this category are zero or virtually zero. For this reason, no calculations are made.

9.4 WINDBLOWN UNPAVED ROAD DUST

Calculation of Annual Emissions

Section 9.3 (above) will estimate fugitive dust from vehicle travel on unpaved roads. Given the same road network, this section (9.4) will estimate fugitive dust stirred by wind using standard AP42 factors applicable to our area.

Calculation of episode-emission day

Historically, snow cover and no wind are associated with typical PM_{10} episode days. Therefore, fugitive emissions from this category for episode and projection days is considered to be negligible.

Calculation of projection emissions

This category will not be included in the projection calculations.

9.5 ROAD CONSTRUCTION DUST

Calculation of Annual Emissions

Each year, the Utah Department Of Transportation counts (or estimates) the number of roadway lanes miles within each county under their management. Annual changes will be assumed to indicate road segments constructed during the previous 12 months. Combined this information with AP42 factors will provide an estimate of fugitive dust from road construction.

Calculation of episode-emission day

Historically, snow cover and no wind are associated with typical PM_{10} episode days. Therefore, fugitive emissions from this category for episode and projection days is considered to be negligible.

Calculation of projection emissions

This category will not be included in the projection calculations.

9.6 AGRICULTURAL LAND PREPARATION DUST

Calculation of Annual Emissions

The Utah Department Of Agriculture publishes annual acreage of harvested cropland by county. This information, combined with some basic assumptions about farming practices, will be combined with AP42 emission factors (for PM only) to estimate fugitive dust emissions within the domain area.

Calculation of episode-emission day

Historically, snow cover and no wind are associated with typical PM_{10} episode days. Therefore, fugitive emissions from this category for episode and projection days is considered to be negligible.

Calculation of projection emissions

This category will not be included in the projection calculations.

9.7 AGRICULTURAL CROP HARVEST DUST

Calculation of Annual Emissions

The Utah Department Of Agriculture publishes annual acreage of harvested cropland by county. This information, combined with some basic assumptions about farming practices, will be combined with AP42 emission factors (for PM only) to estimate fugitive dust emissions within the domain area.

Calculation of episode-emission day

Historically, snow cover and no wind are associated with typical PM_{10} episode days. Therefore, fugitive emissions from this category for episode and projeciton days is considered to be negigible.

Calculation of projection emissions

This category will not be included in the projection calculations.

9.8 LIVESTOCK OPEN GRAZING AND FEEDLOTS

Calculation of Annual Emissions

The Utah Department Of Agriculture publishes annual head of cattle, sheep, and other grazing and feedlot animals by county. This information, combined with some basic assumptions about livestock feeding practices, will be combined with AP42 emission factors to estimate fugitive dust emissions from their activity within the domain area.

Calculation of episode-emission day

Historically, snow cover and no wind are associated with typical PM_{10} episode days. Therefore, fugitive emissions from open grazing is assumed to be zero for episode and projection days. Fugitive emissions from feedlots is considered to be negligible.

Calculation of projection emissions

This category will not be included in the projection calculations.

9.9 BUILDING CONSTRUCTION DUST

Calculation of Annual Emissions

AP42 emission factors will be combined with estimates of construction activity in each county of the domain to calculate fugitive dust stirred up from (1) the construction wheel and track movement, and (2) wind blowing over exposed soils on construction sites.

Calculation of episode-emission day

Historically, snow cover and no wind are associated with typical PM_{10} episode days. Therefore, fugitive emissions from this category for episode and projection days is considered to be negligible.

Calculation of projection emissions

This category will not be included in the projection calculations.

10. AMMONIA EMISSIONS DATA

10.1 LIVESTOCK AMMONIA

The ammonia emissions from livestock will be estimated by multiplying the number of each type of animal by each applicable emission factor. Per-animal emission factors are supplied in "Development And Selection Of Ammonia Emission Factors", an August 1994 publication, written by R. Battye and his colleagues (hereafter Battye). When Battye's publication is silent for a specific animal type, an emission factor from one of several other secondary sources will supply the factors.

The annual publication, "Utah Agricultural Statistics And Utah Department Of Agriculture And Food Annual Report", will supply the number of domestic livestock animals by county and type. Company-prepared information, supplied through individual Internet sites, will be searched to fill known gaps in livestock numbers that may be missing from any of the above reports.

10.2 DOMESTIC ANIMAL AMMONIA

The ammonia emissions from domestic animals, namely dogs and cats, will be estimated using emission factors from the Battye report multiplied by animal-ownership statistics for households inside the domain. Episode and typical winter season day emissions will be calculated from annual emissions using SMOKE software.

10.3 WILD ANIMAL AMMONIA

The ammonia emissions from wild animals, (such as deer, elk, bear, and rabbits), will be estimated using emission factors from the Battye report (Table 6-1, page 6-3) multiplied by animals estimated by the Utah Department Of Natural Resources (DNR) by county. Spatial and temporal allocations will track with DNR recommendations. Ammonia from the ubiquitous and quickly-degraded droppings of birds and rodents are included in soil ammonia, below.

10.4 SOIL AMMONIA

~~Emission factors are supplied in Tables 5-1 and 5-2 of "1997 Gridded Ammonia Emission Inventory Update For The South Coast Air Basin" (GASCAB), for ten soil and land coverage materials. Soil types and coverage are determined with Global Information System (GIS) technology. Typical winter and episode day emissions will be calculated from annual emissions using SMOKE software.~~

Meteorological conditions during an episode day suggest snowcover with average temperatures in the high 30s and low 40s. Since ammonia is water-soluable, soil chemistry suggests that escaping soil ammonia will likely be encapsulated by this wet snow. For these reasons, no air-borne ammonia is presumed to be released during a typical episode day.

10.5 HUMAN PERSPIRATION, RESPIRATION AMMONIA

The ammonia emissions from human perspiration and respiration, (0.55 and 0.0035 lbs per person annually), will be estimated using emission factors from the Battye report multiplied by the population of each county inside the domain. Episode and typical winter season day emissions will be calculated from annual emissions using SMOKE software.

10.6 HOUSEHOLD CLEANING AMMONIA

The ammonia emissions from household cleaning products, (0.05 lbs per person annually), will be estimated using emission factors from the aforementioned Battye report multiplied by the population of each county inside the domain. Episode and typical winter season day emissions will be calculated from annual emissions using SMOKE software.

10.7 STATIONARY COMBUSTION AMMONIA

The ammonia from the combustion of natural gas, residual oil, an digester gas will be estimated using emission factors from Table 9-3 of "Review Of Current Methodologies For Estimating Ammonia Emissions" (RCMA), written/compiled by Sonoma Technology Inc. Those factors will be combined with energy estimates reported by established fuel agencies. Episode and typical winter season day emissions will be calculated from annual emissions using SMOKE software.

10.8 INDUSTRIAL POINT AMMONIA

Emissions of primary (by ammonia slip) and secondary (created by reaction) ammonia released from established point sources will be estimated using emission factors from Table 9-4 (page 9-13) of the RCMA document. Those factors will be combined with details contained in the Toxic Release Inventory and 1997 and 1998 ammonia data about specific point sources that are identified in the domain. Episode and typical winter season day emissions will be calculated from annual emissions using SMOKE software.

10.9 PUBLICLY-OWNED TREATMENT WORKS (POTW) AMMONIA AND AMMONIA FROM RELATED WASTES

In the "1997 Gridded Ammonia Emission Inventory Update For The South Coast Air Basin" (GASCAB), a factor of 0.118 lbs of ammonia released per million gallons of effluent was utilized for all 32 treatment plants included in that inventory. Presuming constant conditions in Utah, this same factor will be multiplied by the effluent of each POTW inside our study domain. Episode and typical winter season day emissions will be calculated from annual emissions using SMOKE software.

Furthermore, some biological wastes never enter the POTW system but still emit ammonia that should be estimated. This includes ammonia from disposal and reusable baby diapers, and rural or remote outhouses or improvisation. UDAQ accepted and followed the calculation method reported in "Development of the Ammonia Emission Inventory for the Southern California Air Quality Study", Appendix G.

10.10 MUNICIPAL LANDFILLS AMMONIA

Ammonia emissions are indexed to methane in the GASCAB document (section 10.2) at the rate of 0.007 lbs ammonia per lb of methane, and the EPA's Landfill software model estimates methane. Episode and typical winter season day emissions will be calculated from annual emissions using SMOKE software.

10.11 ON-ROAD MOBILE SOURCES AMMONIA

Ammonia emissions are indexed to nitrogen oxide emissions from light-duty gasoline vehicles calculated in the latest edition of the MOBILE software model. According to several separate researchers discussed in the scope study (STI-900031-1965-DSS), general agreement led to a ratio of ammonia-to-NO_x of 1:10. UDAQ will use this ratio and the MOBILE model to calculate ammonia emissions from on-road mobile in the domain.

11. QUALITY CHECKING AND QUALITY ASSURANCE

The 1996 inventory has under gone quality assurance and quality control during the review process for the periodic ozone and CO inventories and the statewide EPA required inventory. Ten percent of the major sources in Utah attainment areas have been checked in detail for all criteria pollutants. UDAQ will quality check the point sources listed in Section 7, Point Source Emission Data. ~~emission points (units) that significantly impact the PM_{10} modeling process for PM_{10}, SO_x, NO_x, and VOC. (The cutoff level for these emission points has not yet been finalized.) Other emission calculations of points or processes that emit these pollutants within the point sources will be assumed to be correct.~~

12. FUTURE ACTIONS

The 1996 annual area inventory will be recalculated using the above estimation methods. The winter season and episode day will be calculated based on the modified figures.

~~The 1996 annual point source inventory will be used to calculate the episode day emissions. Information from large point sources will be included in the modeling data set.~~

~~Ammonia emissions from area and point sources will be calculated using AP42 and EPA research emission factors.~~

~~Research will be done on what emissions come from the Great Salt Lake.~~

~~When the projection years are determined, the method of projecting the inventory will be determined.~~